



Division of Forensic Science 2021 Annual Report

April 20, 2022

*State of Delaware
Department of Safety and Homeland Security
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The Honorable John Carney
Governor

The Honorable Nathaniel McQueen, Jr.
Cabinet Secretary

April 28, 2022

To the Citizens of Delaware:

I am honored to recognize the outstanding work of the men and women of the Division of Forensic Science (DFS) detailed in this year's annual report. We greatly appreciate their dedication and professionalism that has resulted in numerous accomplishments over the last year. I extend a sincere thank you to the Commission on Forensic Science for their continued support.

As our state continued to grapple with the impacts of the COVID-19 pandemic and employees transitioned to work remotely, DFS never wavered in its commitment to serve our citizens. DFS implemented improved safety protocols and our forensic investigators, morgue technicians and pathologist continued to persevere.

DFS was re-accredited by the National Accrediting Body (ANAB) and found to be compliant with hundreds of lab standards. The Division was also re-accredited by the FBI and found to be compliant with their Quality Assurance Standards, while the National Association of Medical Examiners successfully reaccredited the Medical Examiner. By meeting accreditation standards and certifications, the DFS maintains the highest scientific standards and ensures both organizational and individual integrity.

In addition, fire debris testing and analysis were added to the accredited scope of work in the Forensic Chemistry Unit in 2021. Once training is complete, five chemists will be trained to test and interpret arson evidence submitted by the Fire Marshal's Office.

In the past year, DFS successfully utilized multiple funding sources, including grants to purchase new and much-needed instrumentation and equipment for each of its units improving the work environment and operations. These purchases provide not only a safer and more efficient work environment but continue to increase drug testing capabilities to combat the ongoing opioid epidemic. The Toxicology Unit purchased a new Tecan instrument with grant funds from the Division's preliminary ELISA Drug Screen, replacing one that was nearly 13 years old. The instrument is critical in performing the initial drug screen testing in the Toxicology Unit.

The Criminal Justice Council also approved grant funding in 2021 to support training opportunities for the DFS staff. As a result of that funding, DFS was able to increase training which enhanced the knowledge skills and abilities of its staff.

Please join me in extending sincere thanks and congratulations to the women and men of the Division of Forensic Science for a year filled with many accomplishments and successes.

Sincerely,

A handwritten signature in blue ink that reads "Nathaniel McQueen, Jr." with a stylized flourish at the end.

Nathaniel McQueen, Jr.
Secretary



STATE OF DELAWARE
DEPARTMENT OF SAFETY AND HOMELAND SECURITY
DIVISION OF FORENSIC SCIENCE
200 South Adams Street, Wilmington, DE 19801
302-577-3420

The Honorable John Carney
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To My Fellow Delawareans:

On behalf of the men and women of the Division of Forensic Science (DFS), I am happy to present the 2021 Annual Report, which highlights the outstanding work and critical role that the DFS plays in the criminal justice process in Delaware.

The Mission of the DFS is to provide the most reliable scientific analysis of evidence for the administration of justice. Sound and timely pathology and forensic science services are provided for the justice system, driven by crimes committed and deaths occurring in the State of Delaware.

I am proud to report that the DFS continued to meet the mission in 2021 despite the on-going challenges presented by the COVID 19 pandemic, which is a testament to the commitment and professionalism of the team at DFS. Like many businesses, the DFS was forced to pivot day to day operations to protect the well-being of the staff and our stakeholders by allowing for social distancing, mask wearing, personal hygiene and other precautionary measures.

The organizational structure of the Division is a collaborative model where each discipline is equally invested in the overall success of the Division. A stratified model of accountability is used, where each team member has a specific role toward meeting the overall mission.

By continuing to meet accreditation standards and certifications, the DFS maintains the highest scientific standards and ensures both organizational and individual integrity. The work ethic of the employees of the DFS is strong and we hold true to our core values of Integrity, Honesty, Thoroughness, Timeliness and Professionalism.

The DFS recognizes the significance of data sharing and works together with the Department of Health & Social Services, the Division of Public Health, the Department of Justice, the Delaware Information and Analysis Center, Law Enforcement and Federal partners to support the health and safety of the citizens and visitors of the state.

In 2021, the Division continued to pursue both state funding and grant opportunities, which allowed the DFS to purchase state-of-the-art instrumentation and equipment in each of the four units. You will read in the Annual Report how these purchases provide not only a safer and more efficient work environment but continue to increase our drug testing capabilities to combat the ongoing opioid epidemic.



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Fire Debris testing and analysis was added to the accredited scope of work in the Forensic Chemistry Unit in 2021 and once training is complete, there will be 5 chemists trained to test and interpret arson evidence submitted by the Fire Marshal's Office.

With support from Governor Carney and the Legislature, the FY '22 Budget Act provided four additional full-time positions for the Division. These positions will be used to fill critical operational roles in an effort to meet the ever-increasing caseloads in the Medical Examiner and Toxicology Units.

I would like to thank the Criminal Justice Council for their support in providing grant funding in 2021, which provided more training opportunities than ever before for the valued staff at DFS.

I would like to recognize the members of the Commission on Forensic Science for their dedication and commitment to providing oversight and guidance to foster professionalism within, and the development and growth of, the Division of Forensic Science. I am confident that with the continued work of the Commission and with the support of Governor John Carney and the General Assembly, the forward momentum of the Division of Forensic Science will continue in 2022.

I take great pride in the hard work and dedication of the men and women of the Division of Forensic Science and for their continued focus on providing the level of service that our customers and stakeholders deserve and expect. I remain confident that our staff will meet any challenge in order to fulfill our mission.

Sincerely,

A handwritten signature in black ink, appearing to read "John R. Evans".

John R. Evans, Director

The Division of Forensic Science

The Delaware Division of Forensic Science (DFS) was established on June 24, 2014 with the signing of Senate Bill 241 by Governor Jack Markell. Retired Senator Robert I. Marshall was the primary sponsor of the legislation with broad bi-partisan support in both the Senate and House. The bill reassigned

forensic and pathology examinations, formerly performed by the Office of the Chief Medical Examiner (OCME) within the Department of Health and Social Services (DHSS), to the Department of Safety and Homeland Security (DSHS), Division of



Division of Forensic Science, Wilmington, DE

Forensic Science. The Division is comprised of four units including the Medical Examiner, Toxicology, DNA, and Forensic Chemistry. In addition, a Commission on Forensic Science was created by this legislation. The Commission is charged with providing oversight and guidance to ensure professionalism and integrity within the DFS and to support development and growth that better serves the justice system.

During 2021, the DFS continued to enhance operations and administration, embracing every challenge as an opportunity to improve. The DFS has maintained accreditation with the ANSI National Accreditation Board (ANAB). Additionally, the Medical Examiner Unit continues to be accredited through the National Association of Medical Examiners (NAME) and the Toxicology Unit meets the standards established by the American Board of Forensic Toxicology (ABFT). The dedicated staff at the DFS continues to demonstrate a professional commitment to providing accurate, timely, and responsive forensic science service to all members of the criminal justice community in Delaware.



2021 DFS Organizational Chart. (Note that vacant positions are included in totals.)

Divisional Initiatives, Collaboration, and Information Sharing

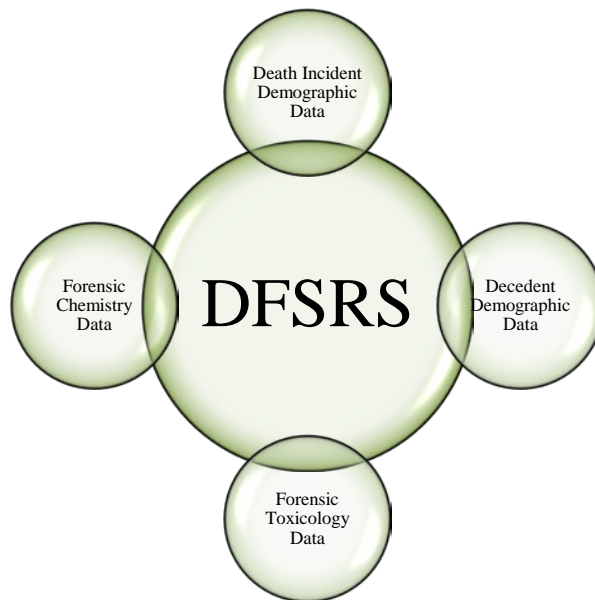
Overview

The Division of Forensic Science believes that sharing of data and DFS information adds value to multiple governmental and academic initiatives. Working together across agencies, federal and state governments, and other stakeholder organizations supports the health and safety of all who we serve. Currently, DFS participates on two statewide commissions related to child death and overdose death, two CDC funded projects, the Delaware Drug Monitoring Initiative, the Delaware Substance Abuse Strategic Planning team, and several other forensic data driven projects with both our public health and law enforcement partners.

To forward the mission, the Division is continuously working on a comprehensive reporting system aimed at producing standardized information to key government and private sector stakeholders statewide. This work is identified as the Delaware Forensic Science Reporting Project (DFSRRP).

DFSRRP- Delaware Forensic Science Reporting System

Delaware Forensic Science Reporting System (DFSRS) is a comprehensive reporting project aimed at producing standardized information to key government and private sector stakeholders statewide. DFSRS is a component of research conducted within the Division of Forensic Science under the Department of Safety and Homeland Security. DFSRS aims to provide consistent, reliable scientific data related to toxicology, forensic chemistry, and death related investigations to assist in law and health related initiatives statewide. This work provides a common platform for all operational and clinical data within the Division of Forensic Science.



DFSRS Model

Incident Demographic Dataset is data retrieved from the Pathology Unit. It includes data points such as: date, ME number, notification time, incident arrival times, responding agencies, incident address, and location type (home, business, accident scene, hospital, etc.). This information can be linked to OEMS, PMP and DELJIS data¹.

¹ Delaware State offices abbreviated are: OEMS – Office of Emergency Medical Services; PMP – Prescription Monitoring Program through the Division of Professional Regulations; and DELJIS – Delaware Criminal Justice Information System.

Decedent Demographic Dataset is data retrieved from the Pathology Unit. It includes data points such as: name, race, ethnicity, age, date of birth, gender, home address, past medical history, medications, allergies, cause and manner of death. A unique identifier can be assigned to each decedent.

Forensic Toxicology Dataset is data retrieved from the Forensic Toxicology Unit. It includes data related to toxicology results of decedents. This data set takes an estimated 30-60 days for the casework to be completed and released by the Chief Toxicologist.

Forensic Chemistry Dataset is data retrieved from the Forensic Chemistry Unit. It includes data related to drug testing and may take up to 90 days to complete casework before the dataset can be populated.

National Violent Death Reporting System

DFS is a key partner in the National Violent Death Reporting System (NVDRS), managed by epidemiology researchers with the Delaware Division of Public Health; Delaware Violent Death Reporting System (DVDRS). This funded project was approved in 2016 and is ongoing. Created by the Centers for Disease Control and Prevention (CDC) in 2002, the NVDRS is a surveillance system that today is implemented in all 50 states, the District of Columbia, and Puerto Rico.

The National Violent Death Reporting System (NVDRS) provides states and communities with a clearer understanding of violent deaths. This information guides decisions by policy makers regarding efforts to prevent violence and track progress over time. NVDRS is the only state-based surveillance system that gathers data on violent deaths from multiple sources. The NVDRS is an incident-based system that links victims and alleged perpetrators with a given incident in one record. This work requires abstractors to collect key data from the DFS for the purposes of supporting effective prevention strategies to reduce violent deaths in Delaware.

Centers for Disease Control Biorepository Program

Since 2016 DFS has continued to partner with the Child Death Review Commission for the collection of biological samples as part of the funded sudden death in the youth (SDY) CDC reporting project. DFS works with the SDY Registry to submit certain cases for DNA sampling as part of the grant requirement. DNA samples are then shipped to the University of Michigan SDY Biorepository. Forensic Investigators work with family members to obtain consent so that the DNA sample will be available for sudden child death research, and to provide valuable information for the health and well-being of surviving siblings. The data and samples are used to create a resource that will be used by the National Institute of Health funded researchers to investigate SDY. An overhaul of the Child Death Review program was performed in late 2015, and as a result Delaware has seen improvements in data surveillance. These efforts are continuously monitored for efficiency and improvement. This vital work

is being conducted through the collaborative efforts of the staff at the Child Death Review Commission and DFS to identify causes of sudden death in our Delaware Children.

Delaware Drug Monitoring Initiative

In 2016 a team of individuals from the State of Delaware were selected to participate in a learning lab with the National Governors Association (NGA) in Washington DC. Delaware was one of only four states chosen to receive grant funding to examine methods for information sharing across state departments and divisions. The Division of Forensic Science collaborated with the Office of Emergency Medical Services (OEMS), the Delaware Information & Analysis Center (DIAC) and the Division of Substance Abuse and Mental Health (DSAMH). The result of this collaborative effort produced a report that is now being distributed quarterly to stakeholders both statewide and federally.

The Delaware Drug Monitoring Initiative (DMI) utilizes data derived from the Delaware Forensic Science Reporting System (DFSRP), Delaware Emergency Medical Reporting System (DEMRS), Delaware Information and Analysis Center (DIAC), and the Delaware Division of Substance Abuse and Mental Health (DSAMH) to be used for situational awareness. The purpose of this initiative is to share consistent, actionable information to address the issues related to the drug epidemic affecting Delaware. The data provided in this report is aimed at assisting multiple agencies across Delaware in an effort to identify those in jeopardy of addiction and/or overdose. These efforts will help inform both law enforcement and public health officials as they work to identify additional treatment needs or programs. While all the data is housed under the respective agencies, the DMI report is created collaboratively within the DIAC for broader reach to key stakeholders. This work has opened the door for collaborative reporting statewide.

Disaster Preparation

The statewide Mass Fatality Plan is an ongoing effort in collaboration with the Division of Public Health to be prepared for a disaster. The Division of Forensic Science has participated in table-top disaster drills and on-scene disaster drills. The purpose of these exercises was to identify areas of strength and weakness, and to test the Mass Fatality Plan before the occurrence of a state disaster. As part of this work, DFS has developed internal Critical Incident Standard Operating Guidelines (SOG). These guidelines provide DFS staff with a framework for emergency operations that falls within the scope of other statewide disaster plans.

The second step of disaster preparation is the development of a statewide Family Assistance Center (FAC) plan. This plan is being modeled after the National Transportation & Safety Board efforts to promote a centralized location for multiple agencies to assist families during a disaster.

Overall Reporting & Collaboration

One of the efforts that the Division of Forensic Science encourages is the sharing of information with stakeholders and government agencies in Delaware. This is accomplished by successful collaboration and participation on commissions and other data analysis efforts across State departments and agencies. We work closely with the Department of Health & Social Services, the Division of Public Health, the Department of Justice, DIAC, and other law enforcement organizations statewide to accomplish this mission.

The Division has also increased our academic interface with the Delaware academic community by opening our doors to tours, promoting forensic internship programs, and participating in quality data collection and research. The Division firmly believes these efforts will promote interest in forensic science disciplines among Delaware students and lead to stronger information sharing projects.

Overall, these external relationships have two goals: to promote confidence in the Division of Forensic Science by demonstrating transparency in forensic principles and processes and to establish the Division as a key contributor across state agencies for the development of policies and initiatives to safeguard the health and safety of all Delawareans.

Community Engagement

One of the goals of the Division is to engage community partners by providing informational resources and encouraging scientific learning. We did have the opportunity to do some community outreach this year, including virtual lectures given to students at DSU, participating in virtual career days, and socially distanced facility tours. The professional staff of the Division of Forensic Science is committed to promoting scientific knowledge and community collaborations.

Assessment, Accreditation, and Quality Assurance

Accreditation is a key component of the quality assurance program at the DFS. To be accredited means that the various units within the DFS are routinely inspected by outside organizations who ensure that the policies, procedures, and/or practices within the Division adhere to strict national or international standards. Standards followed by the DFS include those set forth by the International Organization for Standardization (ISO), the American National Standards Institute National Accreditation Board (ANAB), the American Board of Forensic Toxicology (ABFT), the National Association of Medical Examiners (NAME), and the Quality Assurance Standards (QAS) established by the Federal Bureau of Investigation (FBI).

ISO 17025:2005 Accreditation

The International Organization for Standardization is the world's largest developer and publisher of international standards. Laboratories use ISO 17025 to implement a quality system aimed at improving their ability to consistently produce valid results. Since the standard is about competence, accreditation is a formal recognition of the demonstration of that competence.

The DFS was originally ISO 17025 accredited in 2004 and has continually achieved the highest level of quality standard competency for testing with annual re-accreditation. The current ISO 17025 accreditation was provided by ANAB, which also publishes additional standards that must be adhered to for accreditation, and is scheduled to expire on November 30th, 2024.

American Board of Forensic Toxicology Accreditation

ABFT is dedicated to enhancing and maintaining standards of practice in the field of forensic toxicology.

The toxicology laboratory at the DFS is accredited to the ABFT standards, provided by ANAB and scheduled to expire on November 30th, 2024.

National Association of Medical Examiners Accreditation

The purpose of the NAME accreditation standards is to improve the quality of the medicolegal investigation of deaths in this country. NAME accreditation is an endorsement by NAME that the Division provides an adequate environment for medical examiners to practice their profession and offers reasonable assurances that the ME office serves its jurisdiction well.

The DFS has been NAME accredited since 1980 and continues to be in good standing with this organization. The current NAME accreditation expires January 16, 2023.

FBI Quality Assurance Standards

The FBI's Quality Assurance Standards (FBI QAS) describe the requirements that laboratories performing forensic DNA testing or utilizing the Combined DNA Index System (CODIS) shall follow to ensure the quality and integrity of the data generated by the laboratory. The DFS has been compliant with the FBI QAS since 1997.

Medical Examiner Unit

Overview

The duties of death investigation for the State of Delaware fall to the Medical Examiner Unit (MEU), led by the Chief Medical Examiner (ME), Assistant MEs, Forensic Morgue Assistants, and Forensic Investigators. This Unit is responsible for investigating all suspicious and violent deaths in the State and performs postmortem examinations on cases that fall under its jurisdiction. The Unit operates out of three locations: the main office in Wilmington, the Tobin Building on the Stockley campus in Georgetown, and a satellite office in the Tatnall Building in Dover (Kent County).

For 2021 the MEU investigated 3440 deaths, which is a 7.4% increase in deaths investigated when compared with 2020. In 2021, the MEU accepted jurisdiction for and certified 1779 (or 51.7%) of the deaths investigated. The deaths certified by the MEU represents 16.5% of all deaths registered in the State of Delaware. The overall increase in deaths investigated was due to an increase in deaths where the jurisdiction was accepted as well as where the jurisdiction was declined. The increase in deaths certified was seen in all categories of manner of death. Deaths from drug and alcohol intoxication increased by approximately 15.8% from 449 in 2020 to 520 in 2021.

	2017	2018	2019	2020	2021
Autopsies	610	690	707	760	920
Inspections	307	296	289	331	374
Total Examinations	917	986	996	1091	1294
Inquiries*	386	381	450	504	485
Total Deaths Certified	1303	1367	1446	1595	1779
Non-Jurisdiction Investigations*	875	927	1239	1606	1661
Total Medical Death Investigations	2178	2294	2685	3201	3440
*Note that inquiries are cases under the ME jurisdiction which did not require an examination and non-jurisdiction cases are investigated but determined not to be under ME jurisdiction.					

The MEU reviews and approves all requests for cremations for decedents expiring in the State. The MEU reviewed 4700 cremation requests in 2021 for cases that were not investigated by the medical examiner.

The Medical Examiner collaborates with the Gift of Life Organ Donor Program to approve organ and tissue donations in Delaware. In 2021 the DFS-MEU approved donations from 280 organs and tissue donors. Organs procured included heart, liver, kidneys, lungs, and pancreas. Tissues procured included cornea, skin, long bones, heart valves, and veins.

Operational Impacts from COVID-19 Pandemic

As the COVID-19 pandemic continued through 2021, the protocols established in 2020 afforded the MEU the ability to sustain our operations despite the overall increase in caseload. Although there were some delays in obtaining some equipment and supplies due to global and regional supply chain issues, the effects of supply delays were minor.

DFS-MEU personnel all obtained COVID vaccinations and boosters, and adhered to work-related State mandates to reduce disease transmission. There were no reported instances of and any DFS-MEU employee contracting COVID-19 infection from work related exposure.

Other Unit-Specific Highlights:

In 2021 despite the pandemic-related restrictions the unit was able to make the improvements listed below:

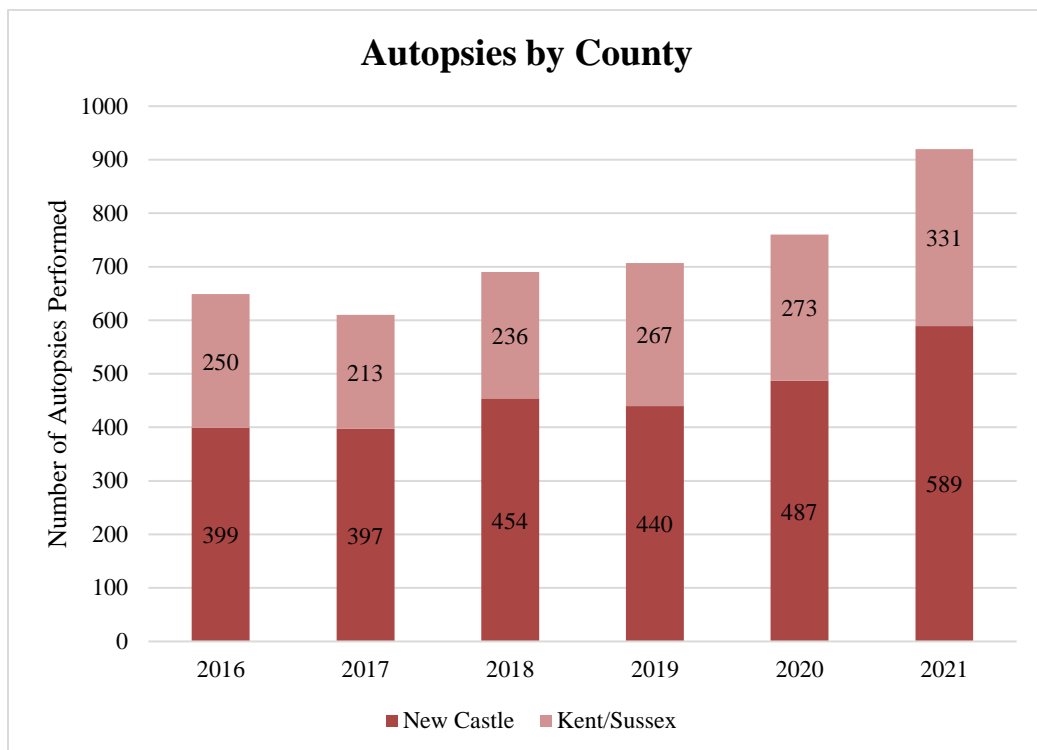
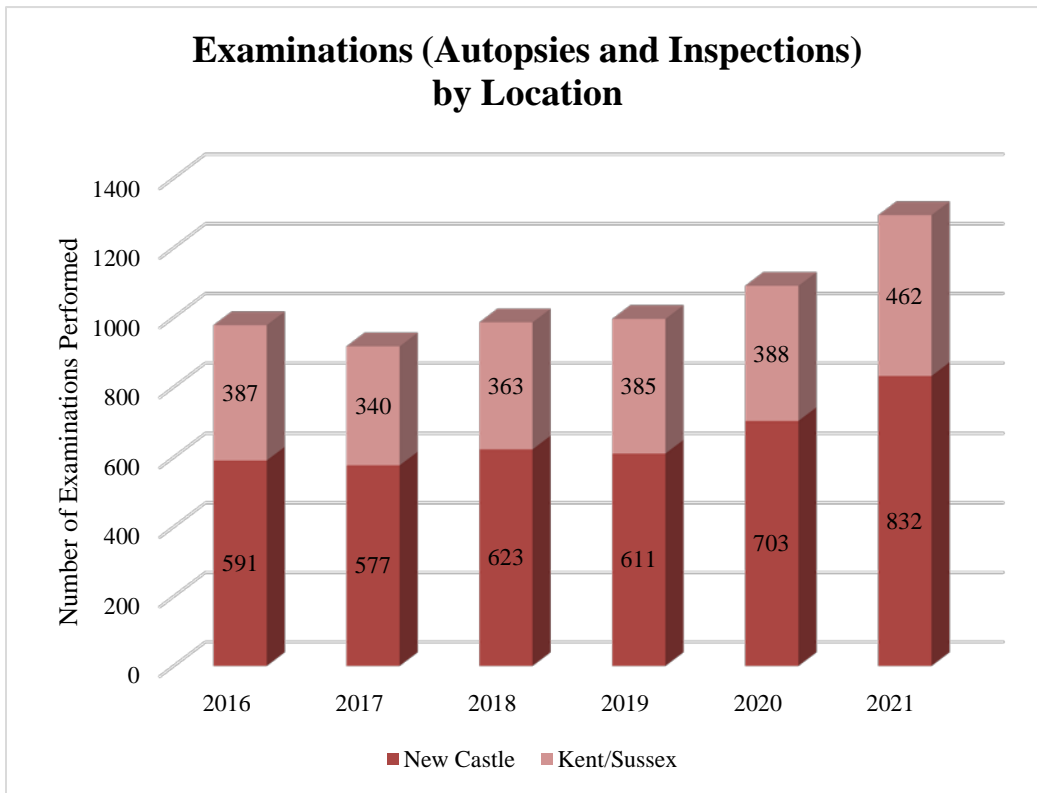
- The MEU was granted two additional positions for Forensic Death Investigators. Both positions will be used to provide much needed personnel to meet the demands of the increased caseload.
- Planning was set in place to reduce the use of paper for storage of records. The intention being to move to a paperless system for record keeping by mid-2022.

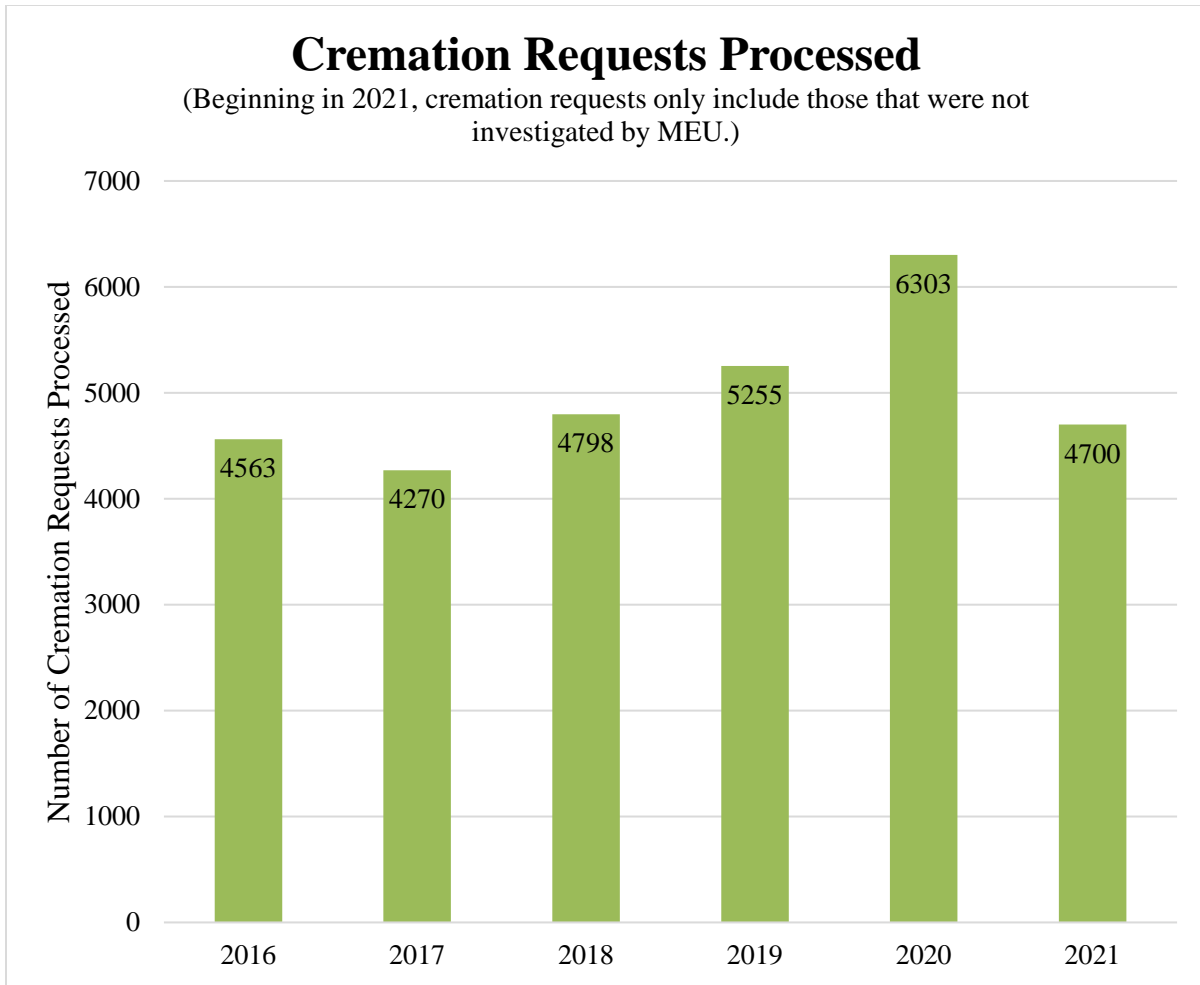
Partners

The MEU would not be able to accomplish our mission without the support of the Department of Safety and Homeland Security and the Delaware General Assembly. In addition, it is important to note the many agencies who assist in providing services to the MEU. These agencies include: Delaware law enforcement agencies, the Attorney General's Office, Fleet Services, Office of the Child Advocate, the staff of all our Delaware hospitals, the Delaware Funeral Directors Association, the Gift of Life Donor Program, the Office of Vital Statistics, and all the funeral homes and health care practices that work with the Division. The MEU and Division values our relationships with all these agencies.

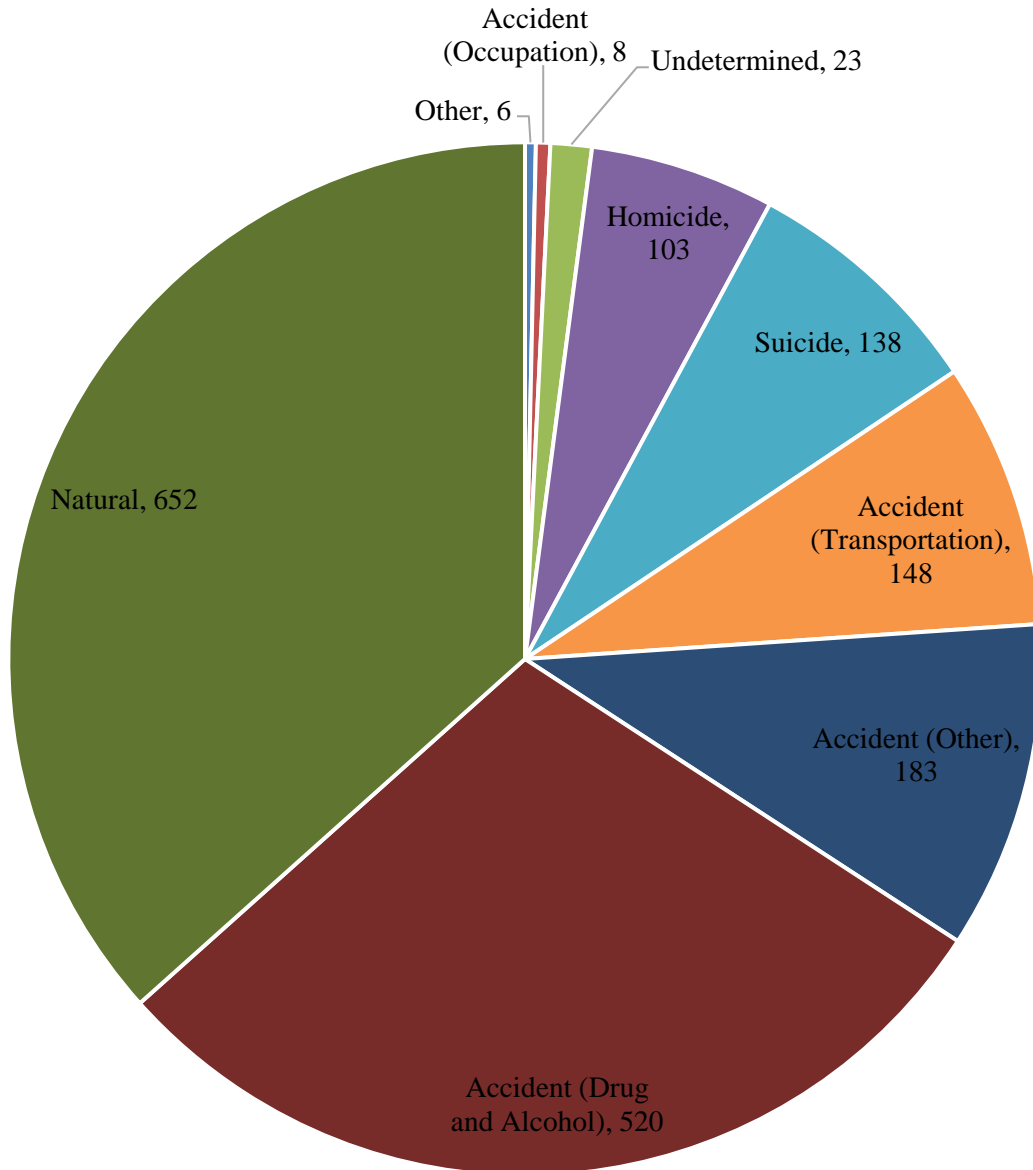
Data

Cases Reviewed



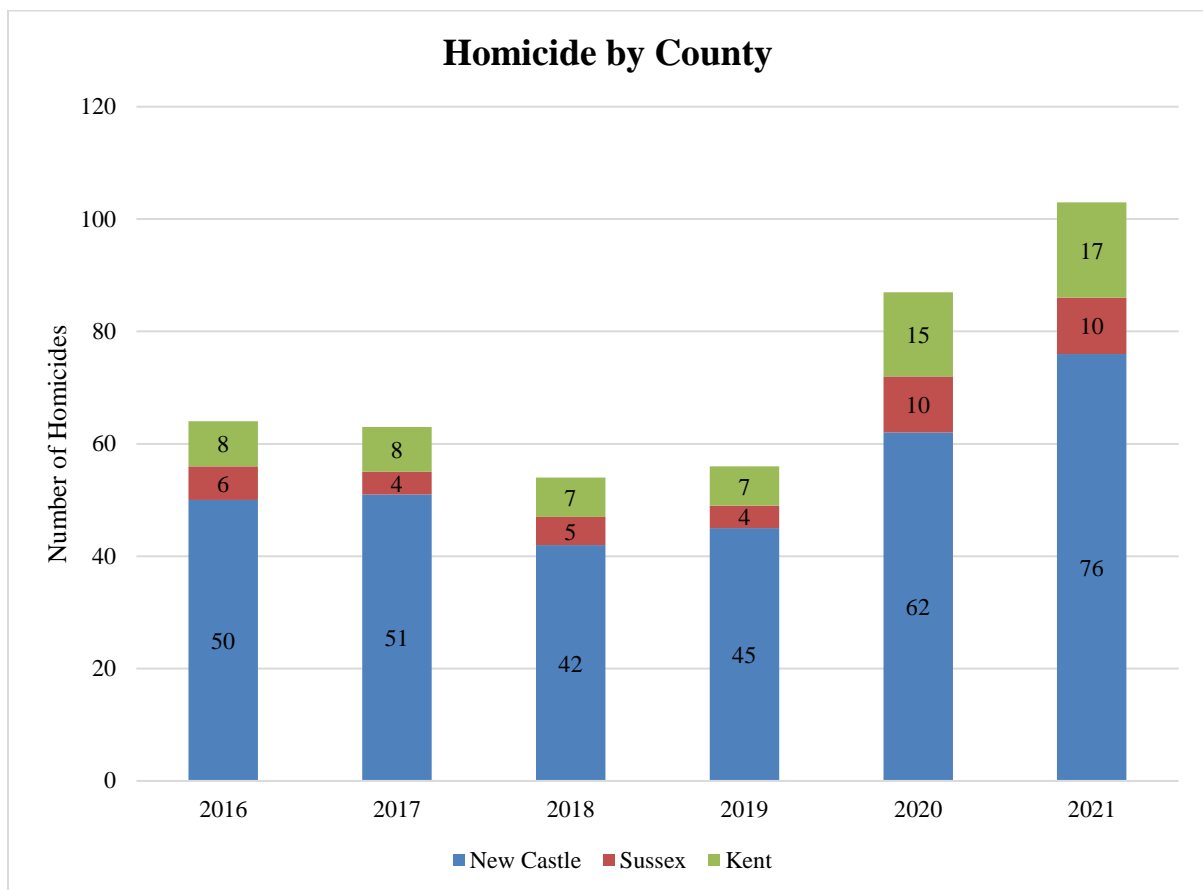
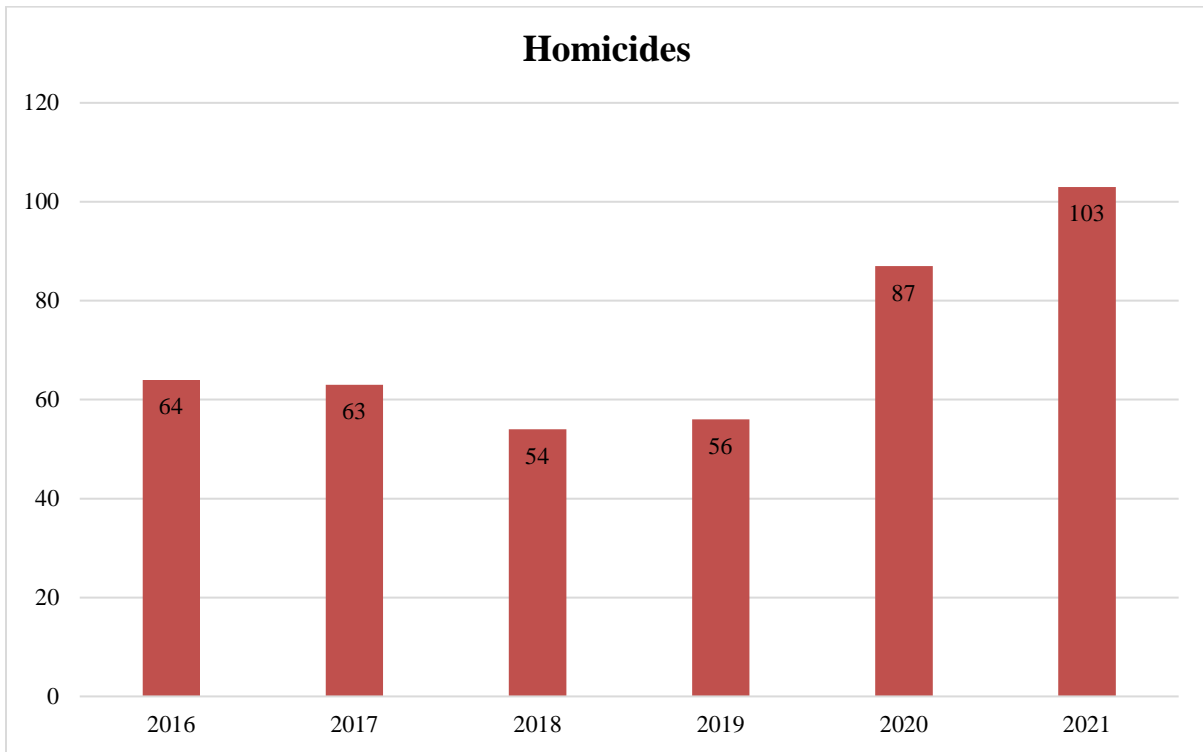


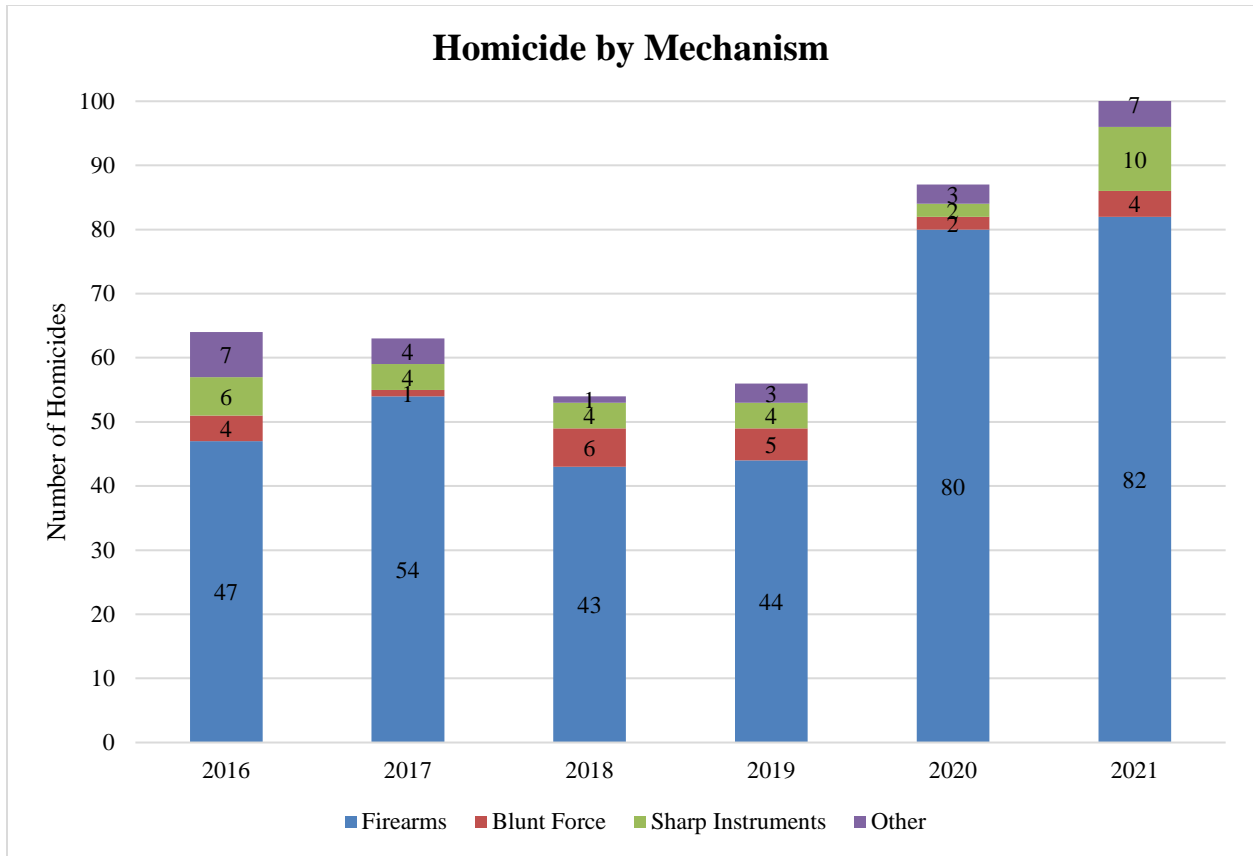
2021 Deaths Certified by Manner*



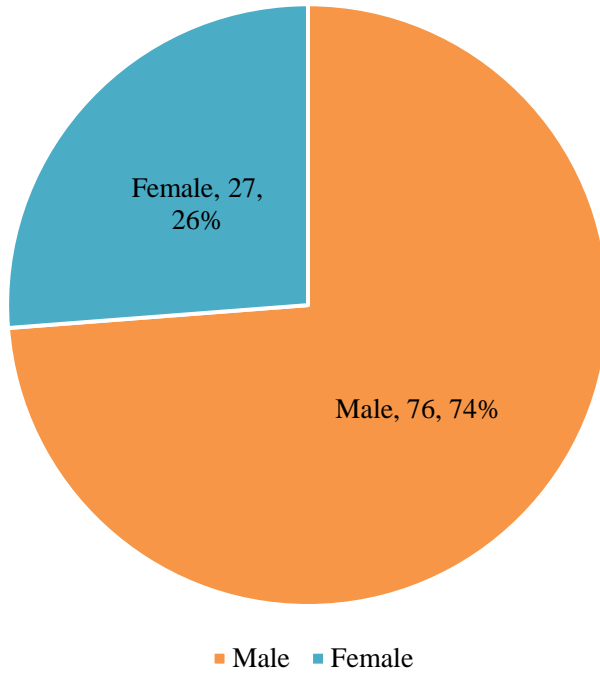
*Note that some deaths were certified with more than one manner.

Homicides

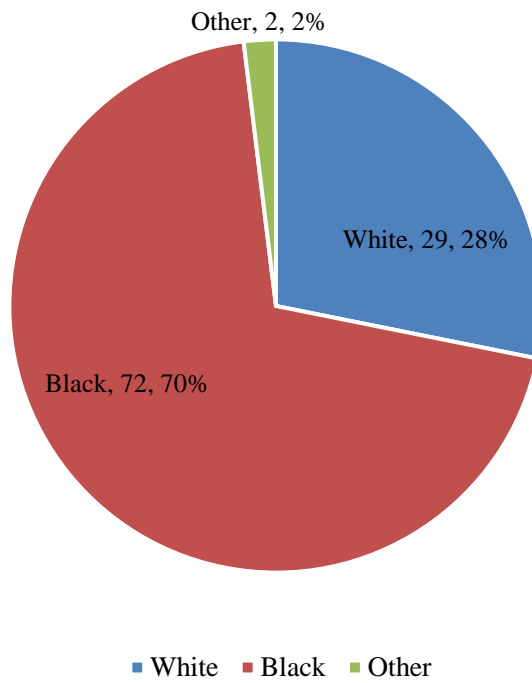




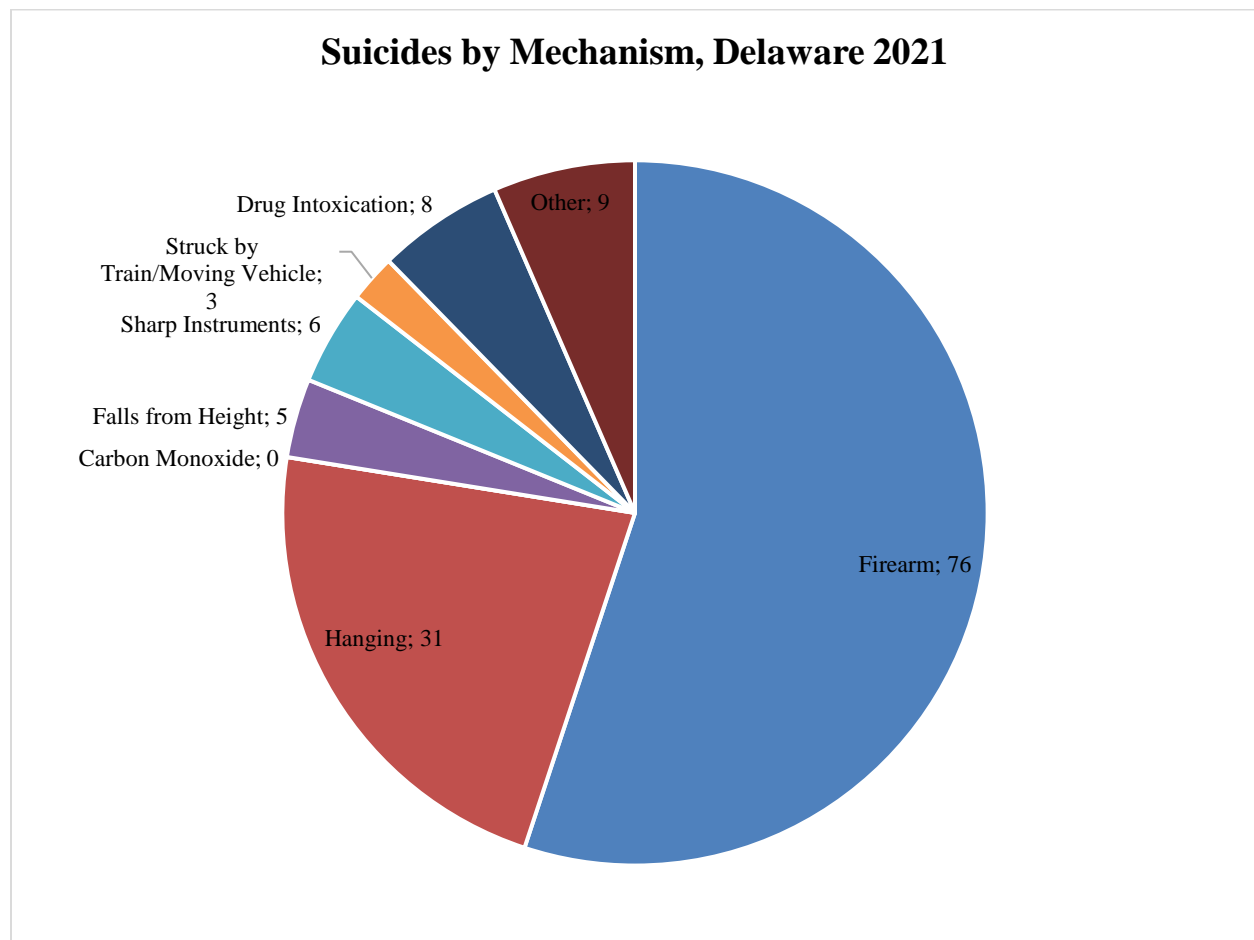
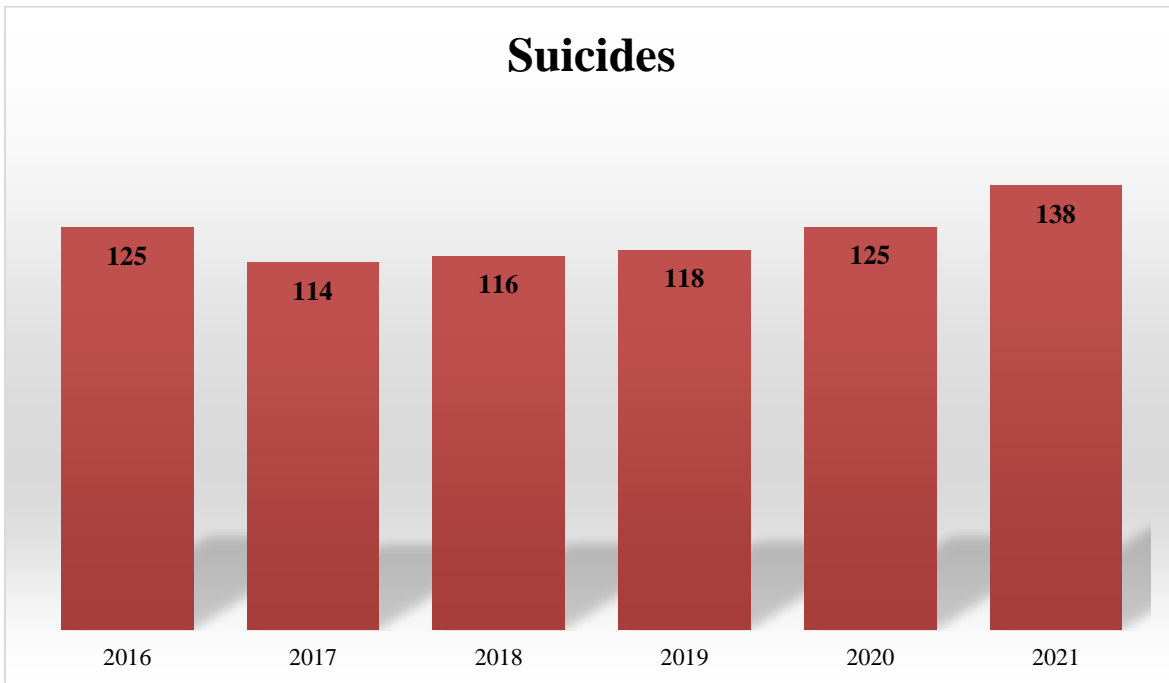
2021 Homicide Victims by Gender



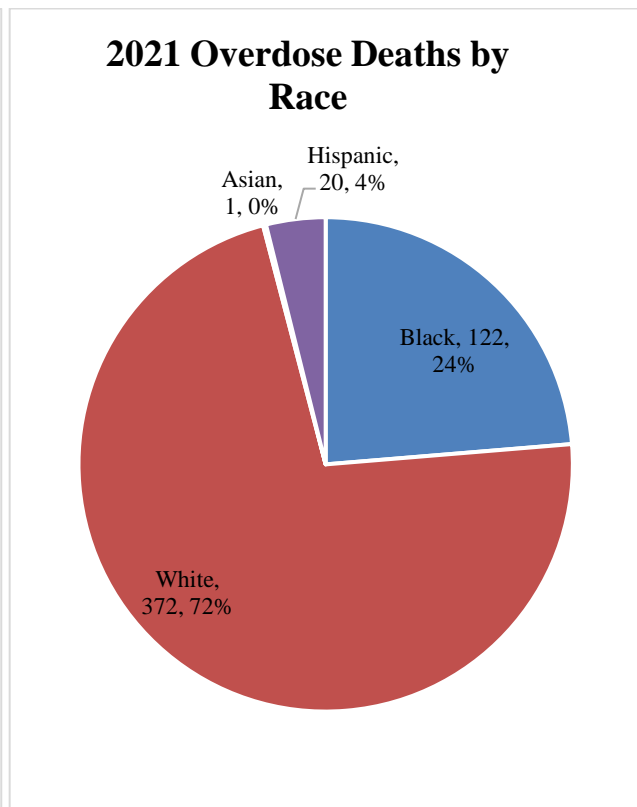
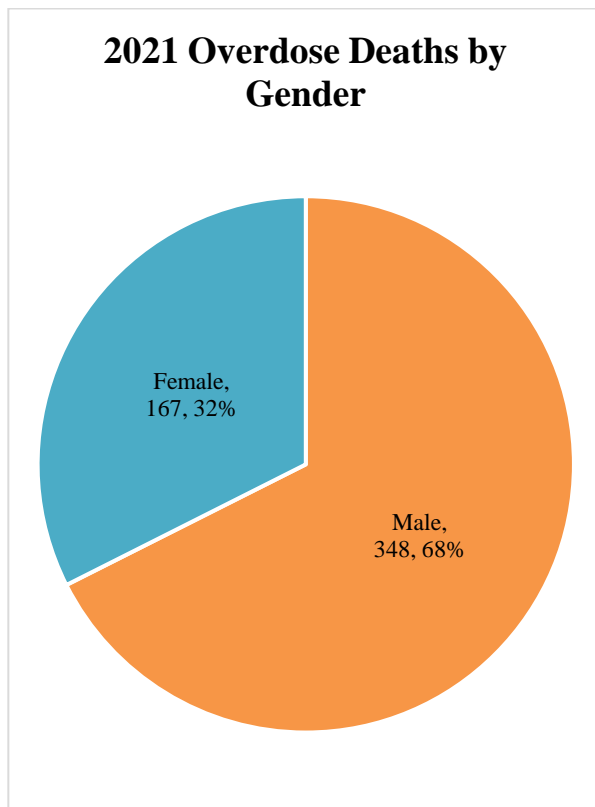
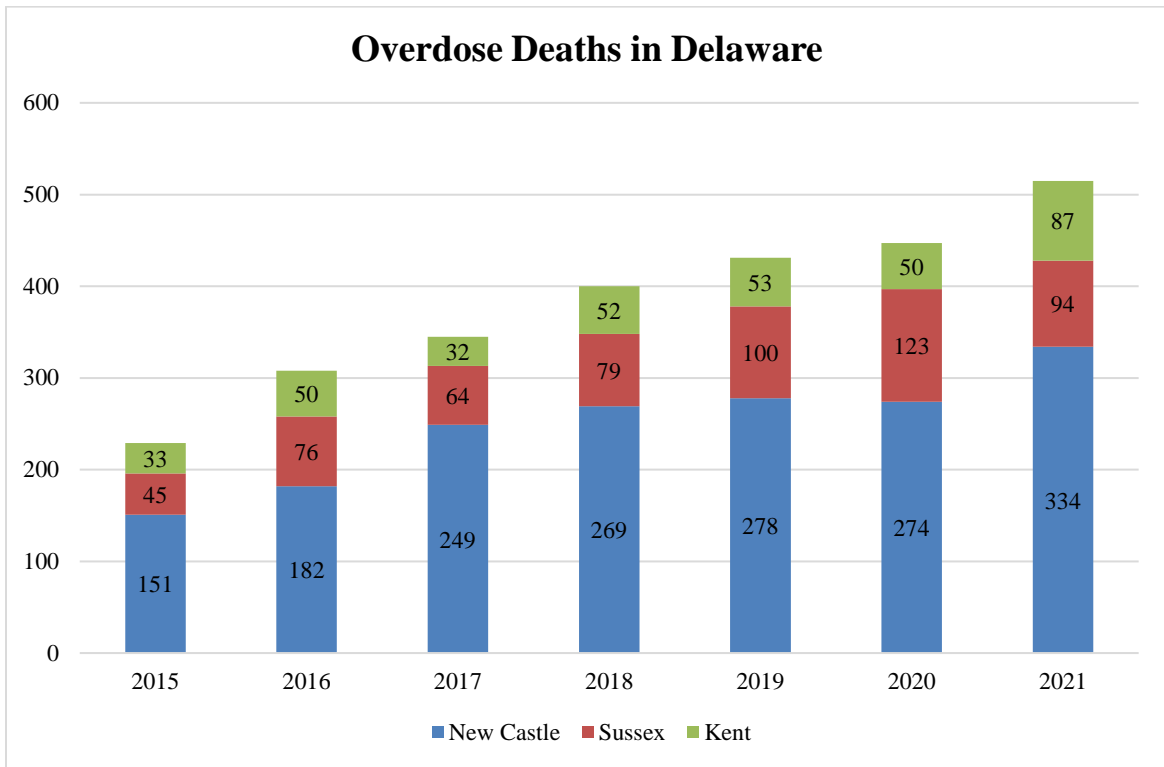
2021 Homicide Victims by Race

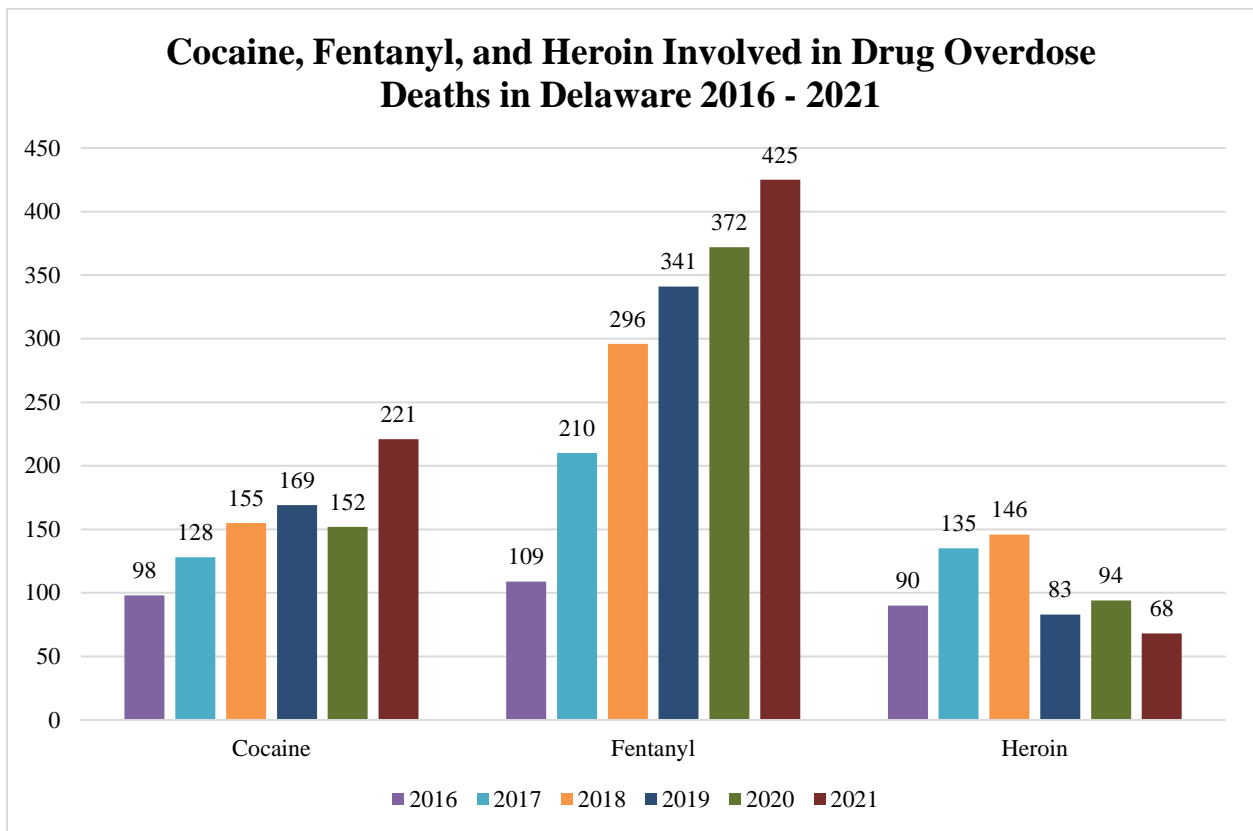
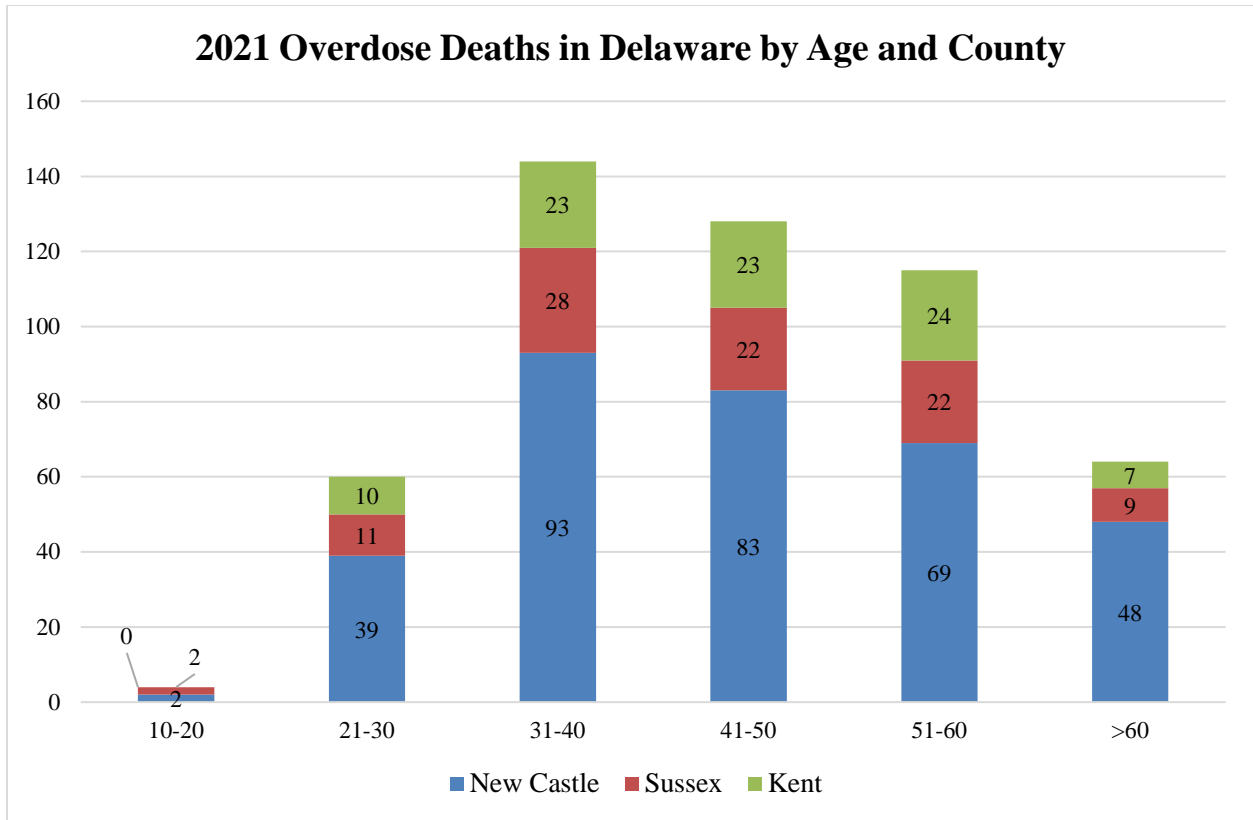


Suicides



Drug Overdose Deaths





Toxicology

Overview

The Toxicology (Tox) Unit of the State of Delaware Division of Forensic Science handles both postmortem and Driving Under the Influence (DUI)/Other cases. The unit is comprised of a staff of 12²: the Chief Forensic Toxicologist, the Casework Laboratory Manager I, the Research Laboratory Manager I, seven Analytical Chemists (six for casework and one for research), and two Laboratory Technicians (one for casework and one for research). Most cases (including all DUIs) begin with a preliminary ELISA (Enzyme-linked Immunosorbent Assay) Drug Screen, which tests qualitatively for the following 18 drugs/drug classes: Amphetamine, Methamphetamine, Opiates, Phencyclidine, Buprenorphine, Methadone, Benzodiazepines, Cocaine, Barbiturates, Cannabinoids, Oxycodone, Fentanyl, Carisoprodol, Diphenhydramine, Ketamine, Meperidine, Tramadol, and Zolpidem. Positives from this screen are entered for additional confirmatory testing. A Special Testing ELISA panel is also available, which includes Acetaminophen and Salicylates.

The Toxicology Unit has 11 confirmatory procedures for the following drug classes/drugs (and their metabolites), which provide quantitation (concentrations or amounts of drugs): Amphetamine-type Stimulants and Bupropion (AMP); Benzodiazepine, Z-drug, and Quetiapine (BENZ); Antidepressant (ADP); Cannabinoid; Cocaine; Fentanyl, Fentanyl Analog, and Synthetic Opioid (FENT); Methadone; Opioid; Phencyclidine; and Alkaline Drugs (Diphenhydramine and Tramadol). All confirmatory procedures utilize Gas Chromatography-Mass Spectrometry (GC-MS) except the AMP, BENZ, ADP, and FENT methods, which use Liquid Chromatography-MS/MS (LC-MS/MS).

In addition to the ELISA Drug Screen, the Toxicology Unit has two confirmatory (but qualitative) drug screens. The Alkaline Drug Screen (ALKDS) procedure covers approximately 200 different compounds, and the Acidic/Neutral Drug Screen (ANDS) covers another approximately 20 compounds.

Alcohol/Volatiles Analysis using Headspace Gas Chromatography with Flame Ionization Detection (GC-FID) is another routine procedure used by the unit. In addition to ethanol, this procedure provides quantitation of acetone, isopropanol, and methanol and qualitative identification of acetaldehyde and 1,1-difluoroethane.

Staffing and Accreditation

The Toxicology Unit added two brand new positions to its team in July 2021. A Research Laboratory Manager I position was created to serve as the immediate supervisor of the Analytical Chemist and

² Note that two positions are brand new as of July 2021, as will be detailed later.

Laboratory Technician in the unit’s research section. This position is the lead role in research and development (R&D) and method validation of new analytical procedures and instrumentation, as well as troubleshooting, diagnosing, and resolving issues with analytical equipment, instrumentation, and methods. The second new position added to the unit is another Analytical Chemist for the casework section to help handle ever-rising caseloads. The Tox Unit had two vacancies for much of 2021 in addition to these new positions not being filled—a newly hired Laboratory Technician worked here for just seven months in 2021, and a part-time Analytical Chemist resigned after nearly seven years with the State. Furthermore, one Tox Unit team member was out for 12 weeks on parental leave.

The Tox Unit is a dually accredited laboratory—both to the standards set by ISO/IEC 17025:2017 and by the American Board of Forensic Toxicology (ABFT). The unit had a surveillance assessment in March 2021 and maintained its laboratory accreditation requirements.

Data

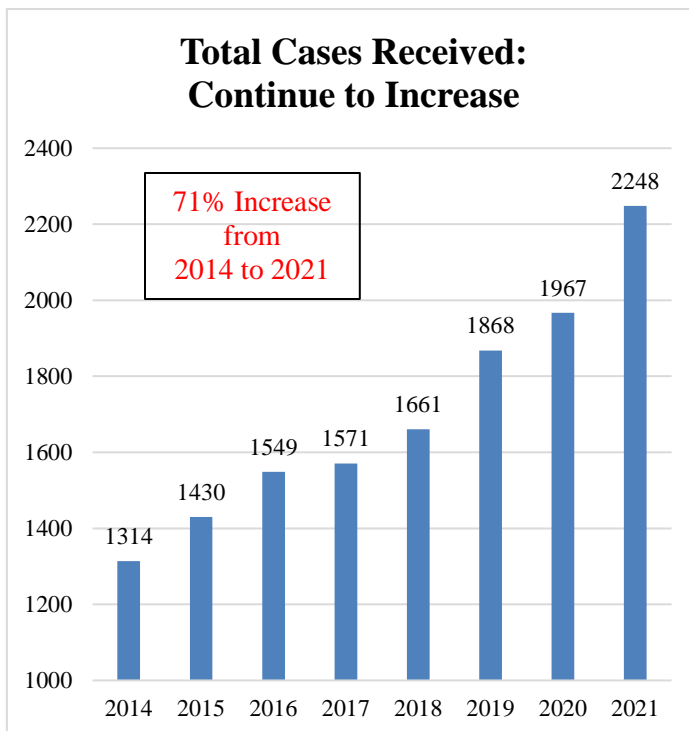
The below statistics have been hand-gathered and hand-tallied.

Total Cases Received and Total Tests Performed

In 2021, the Toxicology Unit received **1026 DUI/Other cases** and **1222 postmortem cases³** for testing. This equated to a total of **2248 total cases received** and **9652 total tests run in 2021**. This bar graph shows how the number of cases received has steadily increased since 2014—**up 71% in just the past eight years**.

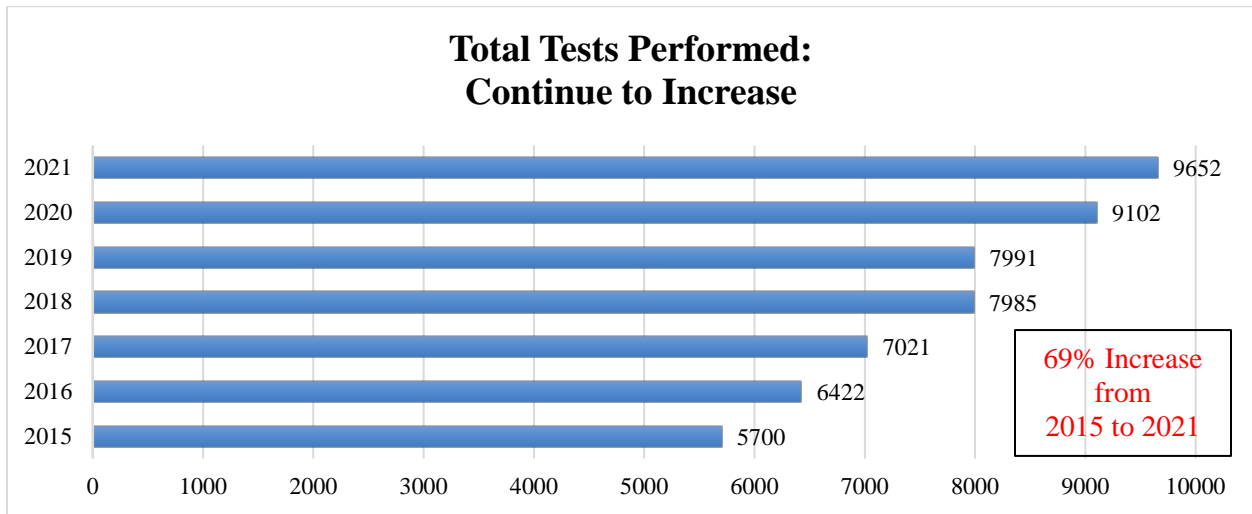
Because each case may have multiple samples and/or require more than one test, and because the unit also runs 40+ proficiency test samples each year (as well as verifications and sometimes repeat samples), the number of tests performed far exceeds the number of cases received each year.

For example, in 2021, there were 9652 tests performed in the Tox Unit—a **69% increase since 2015** (when 5700 tests were performed). Despite increases in caseloads for both case types in 2021, staffing



³ Note that this total does not include an additional 114 cases that were received by the Tox Unit as “Save Only” cases and for which no testing was completed.

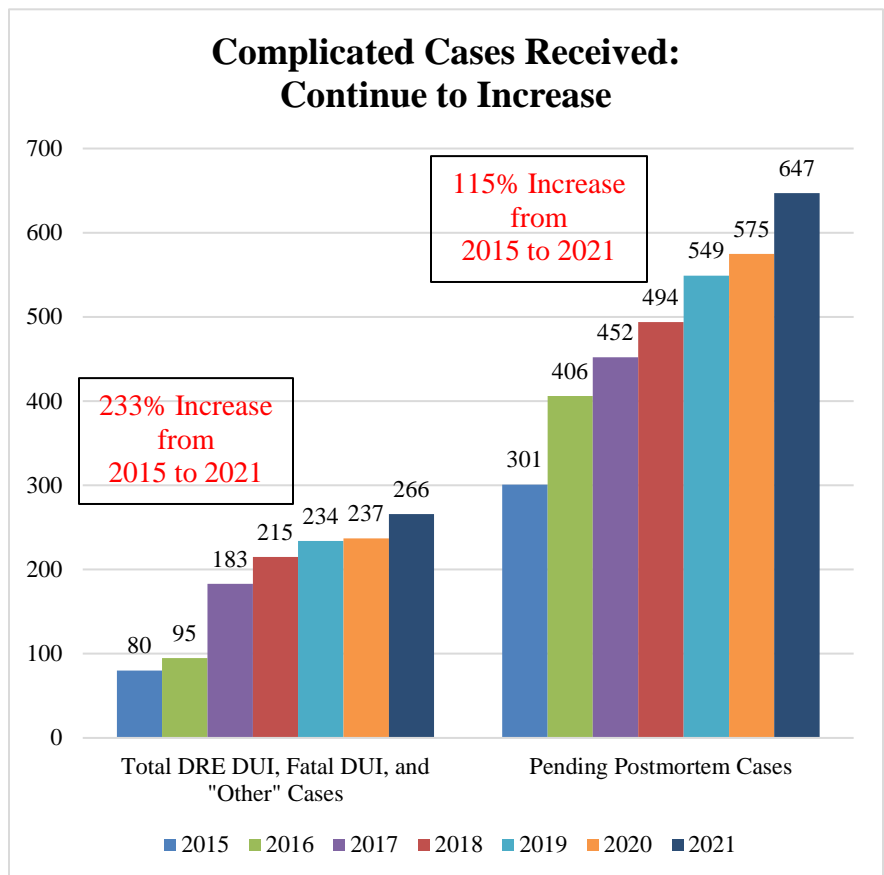
vacancies, and continual challenges presented by the Coronavirus (COVID-19) pandemic, the Tox Unit managed to keep turnaround times at acceptable levels.



Increase in Complicated Cases

DRE DUI, Fatal DUI, and “Other” Cases

To really get a handle on the amount of work being done in the unit, one needs to examine the number and type of tests that are being completed. DUI cases received from Drug Recognition Experts (DREs), for example, generally require significantly more testing than non-DRE cases. The same is true for fatal and “Other” cases such as inquiries into child death or endangerment (including children who have died while caregivers were drug-impaired and children consuming drugs themselves). As the chart



shows, the number of DRE, Fatal, and “Other” cases are rising precipitously, **up 233% since 2015.**

Pending Postmortem Cases

Similarly, different types of postmortem cases require varying amounts of time to complete. Pending cases, so named because the cause and/or manner of death is/are pending further investigation (and which include suspected drug deaths), comprised more than half (53%) of the postmortem cases received. These pending cases often require multiple tests, including time-consuming ALKDS procedures and/or advanced quantitative confirmations. The number of postmortem pending cases is **up 115% since 2015**. The Tox Unit often receives hospital samples from drug overdose deaths for complete testing.

ELISA Drug Screening Data

The below tables display the ELISA Drug Screen results to show the number of positives for each drug/drug class for all cases as percentages of the total cases received. It is important to note that this is screening data, so these are strictly preliminary results.

Fentanyl remains the drug on ELISA with the greatest percentage of postmortem cases screening positive (36.5%), as can be seen in the below table. The next highest percentages, which were all greater than 20%, were as follows: cannabinoids, None Detected, and cocaine.

Postmortem Cases:

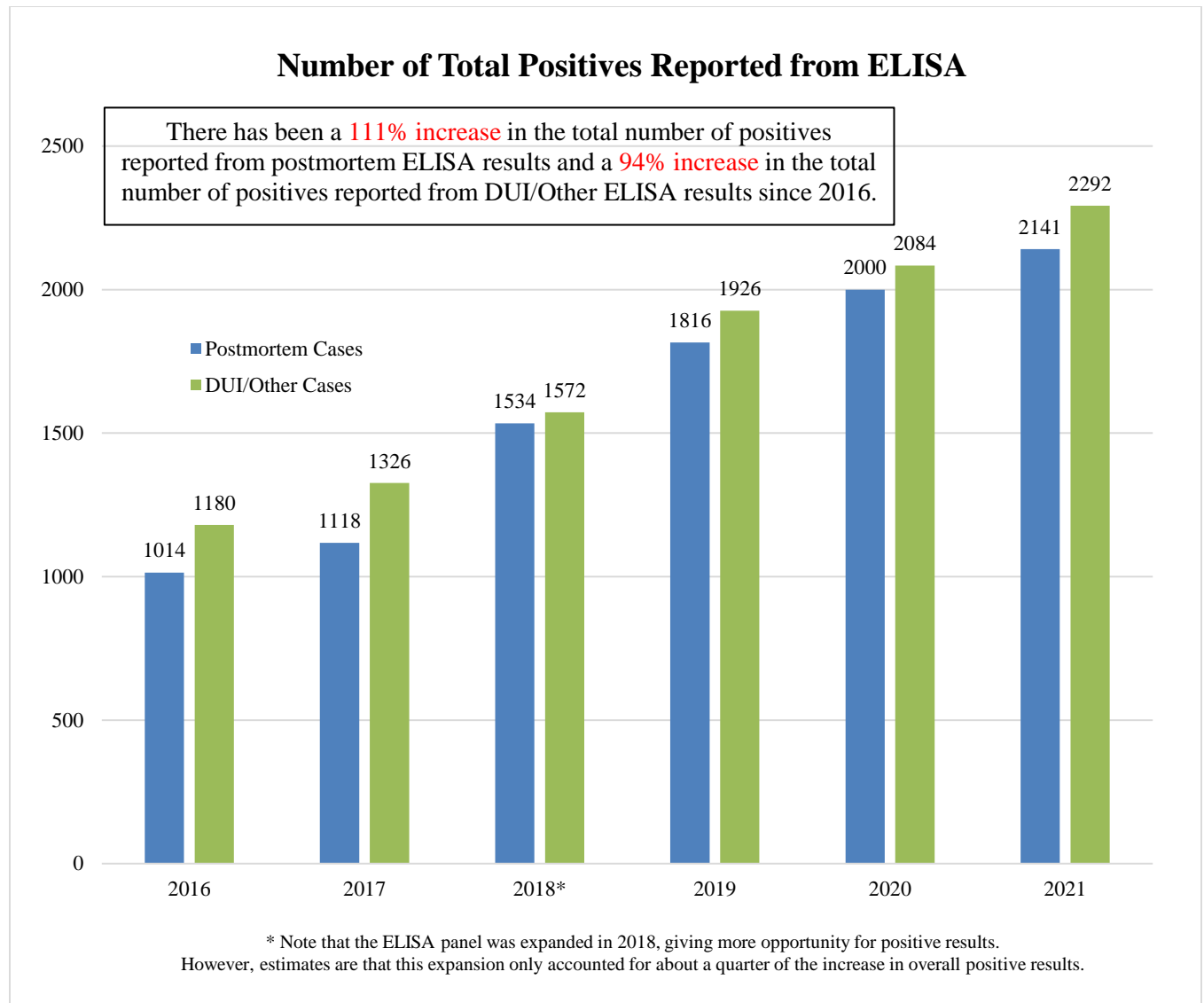
Drug/Drug Class (Cross-Reactives) on ELISA	Percentage of Postmortem Cases that Screened Positive				
	2021	2020	2019	2018	2017
Fentanyl	36.5%	39.1%	37.8%	35.8%	27.8%
Cannabinoids	31.0%	32.6%	26.0%	25.9%	28.0%
None Detected	27.1%	24.2%	25.6%	24.6%	29.5%
Cocaine	21.8%	18.2%	21.0%	21.5%	20.8%
Diphenhydramine	17.2%	17.8%	16.5%	14.5%	0.0%
Opiate	15.5%	21.3%	25.0%	27.9%	20.6%
Amphetamine	14.4%	12.7%	11.6%	10.4%	8.6%
Benzodiazepine	10.9%	11.9%	13.1%	14.0%	10.9%
Methamphetamine	8.4%	7.8%	5.1%	3.4%	1.9%
Oxycodone	6.5%	7.4%	9.0%	8.5%	9.5%
Methadone	5.2%	6.2%	4.0%	4.8%	4.1%
Buprenorphine	2.7%	3.7%	4.4%	2.4%	0.0%
Zolpidem	1.3%	1.2%	1.5%	0.8%	0.0%
Tramadol	1.1%	1.7%	2.7%	1.6%	0.0%
Phencyclidine	0.9%	1.0%	0.8%	1.4%	1.2%
Ketamine	0.7%	1.1%	0.8%	0.8%	0.0%
Barbiturate	0.6%	0.8%	0.6%	0.8%	1.6%
Carisoprodol	0.6%	0.3%	0.4%	0.3%	0.5%
Meperidine	0.0%	0.1%	0.0%	0.0%	0.0%

Of the DUI/Other cases received in 2021, 52.6% screened positive for cannabinoids (marijuana). Fentanyl, cocaine, and benzodiazepines are the next top three categories. Looking at the below table, the drug/drug classes that saw the greatest increases between 2020 and 2021 were fentanyl, cocaine, and methamphetamine (percentages underlined below).

DUI/Other Cases:

Drug/Drug Class (Cross-Reactives) on ELISA	Percentage of DUI/Other Cases that Screened Positive				
	2021	2020	2019	2018	2017
Cannabinoids	52.6%	55.3%	57.1%	49.3%	53.1%
Fentanyl	<u>44.2%</u>	<u>41.5%</u>	<u>37.7%</u>	<u>32.8%</u>	<u>22.7%</u>
Cocaine	<u>24.1%</u>	<u>20.8%</u>	20.8%	24.4%	25.3%
Benzodiazepine	20.9%	26.3%	24.7%	21.1%	20.9%
Opiate	17.2%	24.5%	24.1%	24.8%	21.7%
Methamphetamine	<u>14.4%</u>	<u>11.8%</u>	9.7%	4.2%	3.8%
Methadone	13.5%	13.2%	11.9%	7.8%	8.2%
Amphetamine	12.8%	12.2%	8.4%	5.6%	4.3%
None Detected	9.1%	6.4%	5.6%	7.7%	9.1%
Phencyclidine	6.2%	7.7%	4.9%	7.8%	6.4%
Buprenorphine	5.4%	5.4%	4.4%	4.5%	N/A
Diphenhydramine	5.4%	6.3%	7.2%	6.6%	N/A
Oxycodone	5.2%	6.6%	8.8%	7.8%	9.7%
Zolpidem	0.8%	1.1%	1.5%	1.5%	N/A
Carisoprodol	0.6%	0.5%	0.8%	0.4%	1.1%
Ketamine	0.6%	1.4%	0.6%	0.3%	N/A
Barbiturate	0.4%	0.2%	0.8%	1.3%	0.7%
Tramadol	0.4%	0.8%	0.7%	0.6%	N/A
Meperidine	0.0%	0.0%	0.0%	0.0%	N/A

As the below chart shows, the number of total positives reported from the ELISA Drug Screen has risen sharply in the last six years—**up 111% for postmortem cases and up 94% for DUI/Other cases.**



Top Ten Reported Compounds from Confirmatory Procedures

The below tables show confirmatory results. For postmortem cases, fentanyl stayed in the #1 spot as the top reported compound from confirmatory procedures in 2021, where it has been for four straight years (at 35.0% of all postmortem cases received), followed by norfentanyl (a metabolite of fentanyl, 26.1%), 4-ANPP (a minor fentanyl metabolite and an intermediate in its synthesis, 25.4%), and ethanol (also 25.4%), which was in the #1 spot in 2017 and 2016.

What is interesting to note in 2021 was the emergence of para-fluorofentanyl, which is a potent fentanyl analog that is a Drug Enforcement Administration (DEA) Schedule I controlled substance. This analog now accounts for 11.9% of postmortem casework and is #8 in the top ten list below. As a subsequent chart shows, in 2020 para-fluorofentanyl was detected in just 4 postmortem cases and 3 DUI/Other cases,

compared to 145 and 95 cases, respectively, in 2021. This translates to a >3000% increase in para-fluorofentanyl cases from 2020 to 2021.

Postmortem Cases:

Top Ten Order	Confirmatory Method	Compound	As a Percentage of Total Postmortem Cases Received
1	Fentanyl	Fentanyl	35.0%
2	Fentanyl	Norfentanyl	26.1%
3	Fentanyl	4-ANPP	25.4%
4	ALC/VOLS	Ethanol	25.4%
5	Cocaine	Benzoyllecgonine	21.1%
6	Cocaine	Ecgonine Methyl Ester	18.2%
7	Cocaine	Cocaine	16.9%
8	Fentanyl	para-Fluorofentanyl	11.9%
9	Opiates	Morphine	9.4%
10	Diphenhydramine	Diphenhydramine	6.9%

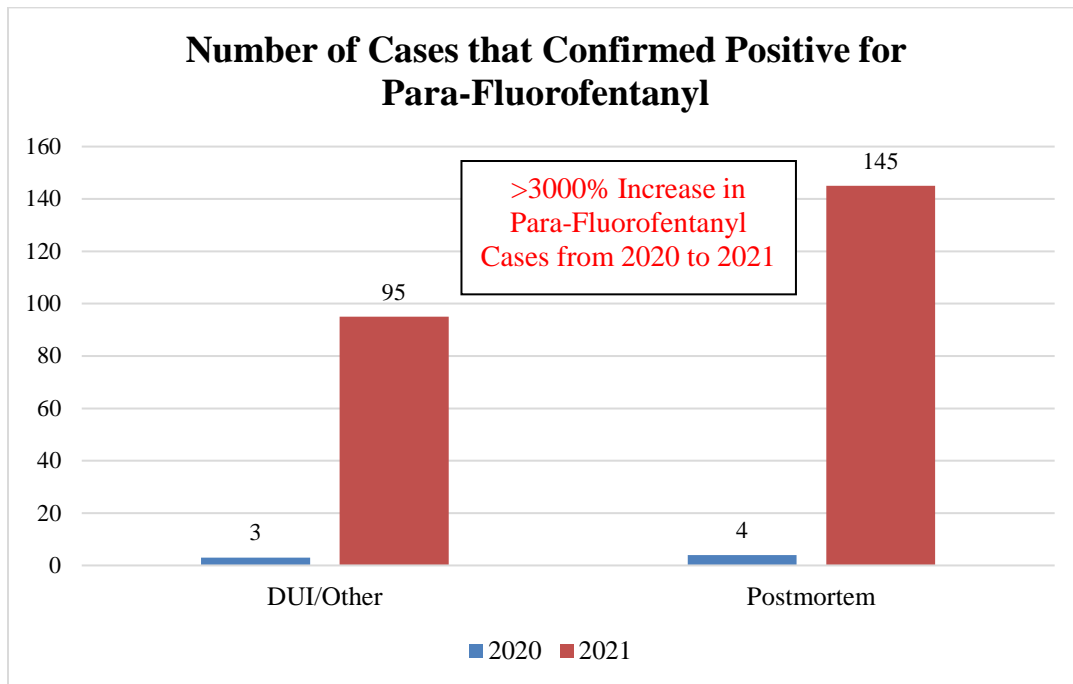
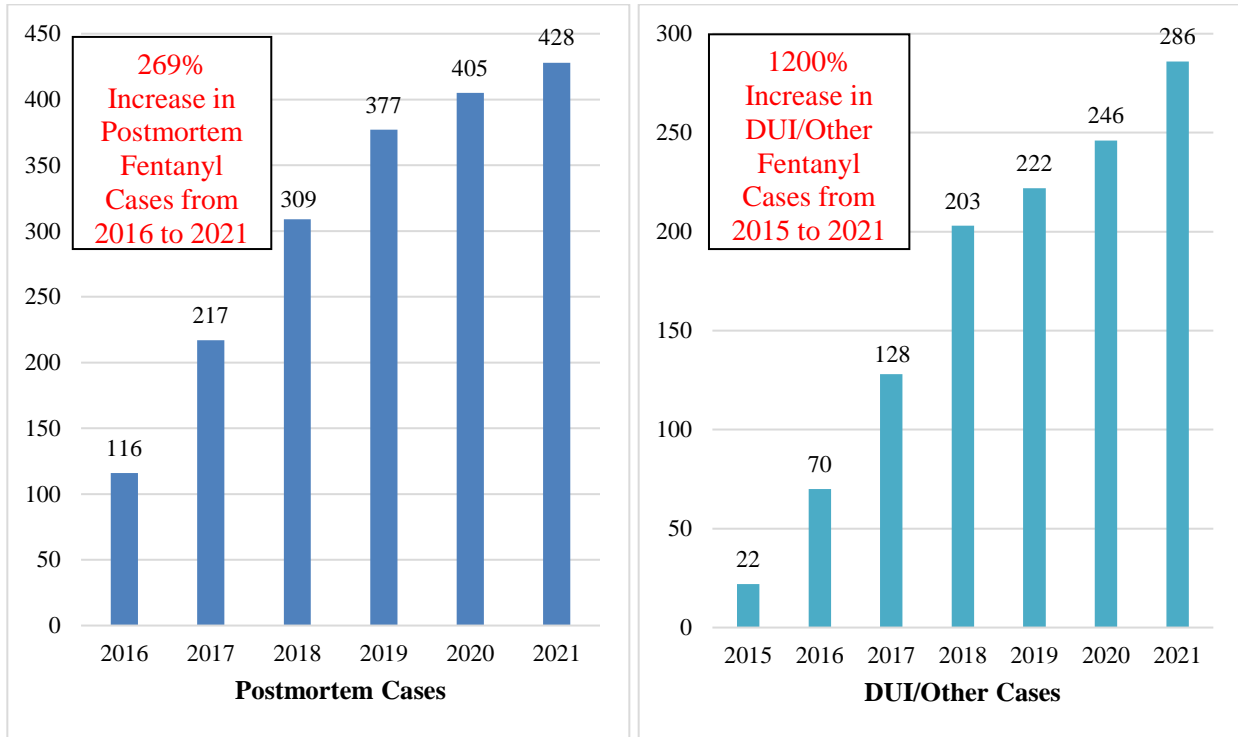
The inactive marijuana metabolite, delta-9-carboxy-tetrahydrocannabinol (THC-COOH), was confirmed positive in 33.8% of the DUI/Other cases received, in the #1 spot, and the active parent compound of marijuana, delta-9-tetrahydrocannabinol (THC), was confirmed positive in 22.7% of DUI/Other casework, in the #4 spot. Fentanyl remained as the second top reported compound for DUI/Other cases at 27.9%, and norfentanyl was third again (26.0%).

DUI/Other Cases:

Top Ten Order	Confirmatory Method	Compound	As a Percentage of Total DUI/Other Cases Received
1	Cannabinoids	Delta-9-Carboxy-Tetrahydrocannabinol	33.8%
2	Fentanyl	Fentanyl	27.9%
3	Fentanyl	Norfentanyl	26.0%
4	Cannabinoids	Delta-9-Tetrahydrocannabinol	22.7%
5	Cocaine	Benzoyllecgonine	18.6%
6	Fentanyl	4-ANPP	16.6%
7	AMP	Methamphetamine	13.5%
8	AMP	Amphetamine	11.8%
9	Cocaine	Cocaine	10.0%
10	Methadone	Methadone	9.6%

Fentanyl confirmations in the Tox Unit have increased **269% for postmortem cases since 2016** and **1200% for DUI/Other cases since 2015**, as the below charts illustrate. This shows how the opioid/fentanyl epidemic continues to escalate.

Number of Cases that Confirmed Positive for Fentanyl



Projects and Grants

The Toxicology Unit completed one project in 2021, which was the validation of a new Tecan instrument for the preliminary ELISA Drug Screen in March. This instrument was purchased with grant funds through the Criminal Justice Council (CJC) at the end of 2020 to replace one that was nearly 13 years old.

The Tox Unit received additional federal grant funds in 2021 through the Centers for Disease Control and Prevention's (CDC's) Overdose Data to Action (OD2A) cooperative agreement to support their efforts in response to the opioid/fentanyl epidemic as well as through the CJC. With these funds, the unit purchased new software and computers for their instrumentation to move to Windows 10 as well as new laboratory chairs to replace worn ones. Additionally, team members were able to participate in continuing education trainings through the following organizations: Agilent Technologies, the Society of Forensic Toxicologists (SOFT), the Center for Forensic Science Research and Education (CFSRE), and The International Association of Forensic Toxicologists (TIAFT).

In closing, the Tox Unit would like to acknowledge the following publication and poster in 2021 of its research team member for her prior research and validation of a new amphetamine-type stimulant and synthetic cathinone confirmatory panel on LC-MS/MS:

- **Karampela S, Smith J,** and Panderi I. Determination of 19 Psychoactive Substances in Premortem and Postmortem Whole Blood Samples Using Ultra-High-Performance Liquid Chromatography–Tandem Mass Spectrometry. *Separations*. 2021; 8(6):78.
<https://doi.org/10.3390/separations8060078>.
- **Karampela S, Smith J,** and Panderi I. Determination of 19 Psychoactive Substances in Biological Samples by Ultra-High-Performance Liquid Chromatography–Tandem Mass Spectrometry. 12th International Conference on “Instrumental Methods of Analysis” (IMA-2021) 20-23 September 2021 as a Virtual event organized by the Aristotle University of Thessaloniki and the National Technical University of Athens
http://aclab.web.auth.gr/ima2021/#xl_xr_page_index.

DNA

Overview

The DNA laboratory consists of two sections, the Databasing or CODIS (COmbined DNA Index System) section and the Casework section. The Databasing section processes all the convicted offender samples submitted to the laboratory from the Delaware State Police/State Bureau of Identification (DSP/SBI), Probation and Parole, and the Department of Corrections (DOC), then uploads the generated DNA profiles into the CODIS database. The Casework section examines evidence, conducts preliminary testing for body fluids, performs DNA testing, and interprets data derived from the tests to draw and support conclusions. The laboratory accepts all types of cases ranging from theft and property crimes to homicides and sexual assaults. The DNA profiles generated from processing casework may also be entered into CODIS at either the State or National index (level).

CODIS

At the beginning of 2021, 153 offender samples had not been uploaded to CODIS. All of these samples were received by the laboratory in December of 2020. All these samples were uploaded into CODIS in 2021. In 2021, the CODIS section received an additional 1383 offender samples. This number includes samples that could not be tested due to incomplete submission information. The laboratory received approximately 60% more samples in 2021 than in 2020.

Although the number of offender samples received in 2021 increased, the average turnaround time (TAT) for uploading offender samples into the National database stayed the same from an average of 20 total days (15 working days) in 2020 to an average of 20 total days (15 working days) in 2021. We continue to get offender samples with incomplete submission information. Additionally, we continue to work with DOC when samples do not produce a usable profile.

In 2021, 1232 offender samples and 157 casework samples were uploaded into the State and National indexes. Offender samples were processed monthly, and by the end of the year all samples received prior to December 2021 had been uploaded into CODIS.

In 2021, the DNA laboratory had 59 CODIS hits or “matches” from either the State or National index. This includes 9 cases from New Jersey, Pennsylvania, Maryland, FBI, and Washington state that hit to DE convicted offenders. The CODIS hits included theft, burglary, robbery, sexual assault, and homicide cases. There have been a handful of incidents where a convicted offender’s sample was collected and uploaded on good faith into CODIS. When the offender’s profile hit on an evidence sample, it was realized that the profile had to be removed from CODIS because the offender did not have a qualifying

offense under Title 11. We have been in contact with DOC about proper collection. Additionally, we have proposed a legislative initiative to collect samples from all felonies.

Delaware has received Sexual Assault Kit Initiative (SAKI) Grant funds for testing sexual assault kits that were collected prior to April 30, 2015. These kits are being tested by a private laboratory; however, any kit that results in a DNA profile foreign to the victim is reviewed by DFS for upload into CODIS. We began receiving profiles from the private laboratory in May 2017. All kits in Delaware have been tested and in 2021 we uploaded 1 unknown profile into CODIS from SAKI cases. Previous SAKI profiles that were entered into CODIS have resulted in 5 hits at the state level and 2 hits at the national level.

The table below reflects the types of cases that have hit in CODIS for 2021.

CODIS Hits	Type of Case	CODIS Hits	Type of Case
16	Burglary	3	Robbery
2	Homicides	2	Unidentified remains
17	Sexual Assaults	1	Home Invasion
1	Assault	8	Theft/trespassing/criminal mischief
6	Stolen/theft of motor vehicle	1	Forgery
1	Possession of firearm during felony	1	Indecent exposure

Casework and Grants

In the beginning of 2021, there were 63 cases that were either assigned but not completed or unassigned from 2020. Thirty-seven (37) of those cases were unassigned, this included cases with suspects and unknown suspects. In 2021, the DNA unit received 584 new case submissions and 28 subsequent submissions for a total of 612 submissions. Subsequent submissions are defined as those cases requiring additional testing after a report has been issued or those cases where a report was held until additional evidence had been submitted and tested. There was an approximate 9% increase in the total number of submissions from the previous year. By the end of 2021, there were 49 cases that were either assigned but not completed or unassigned.

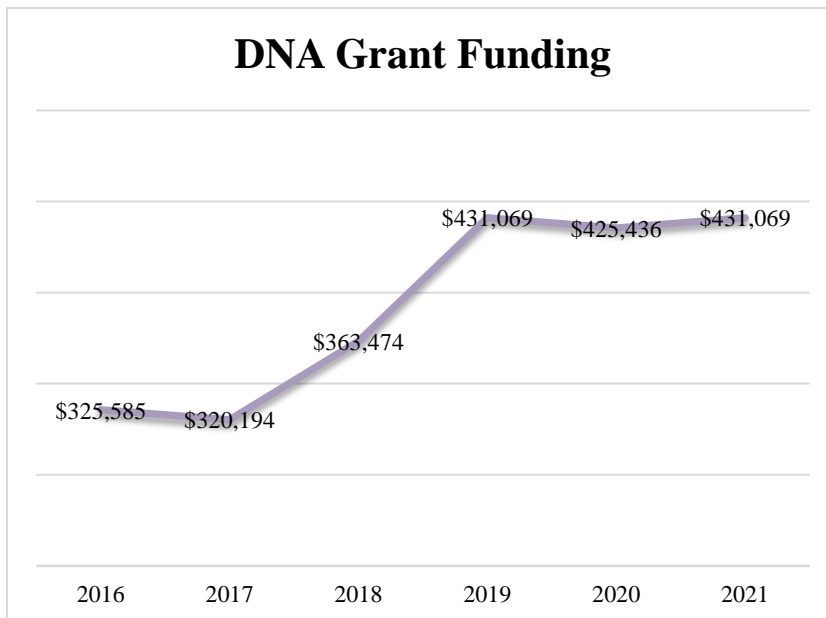
Types of Cases Received in 2021	New Submissions	Supplemental Submissions
Homicide / Att. Homicide	38	9
Sexual Assault	151	12
Assault	32	1
Burglary	40	2
Robbery	17	0
Missing Person/Death Investigation	6	2
Miscellaneous	103	1
Possession of Firearms	180	1
Proficiency Tests	17	0

This is about a 22% decrease from the previous year. The number of unassigned cases at the end of 2021 was 22, compared to 37 in 2020. This is about a 41% decrease.

The table provides a breakdown of the types of cases received during 2021.

Our average turnaround time (TAT) increased from 27 total days in 2020 to 55 total days in 2021. In 2021, not only did we have an increase in the number of cases that were submitted when compared to 2020, but we also had an increase in the number of specimens we examined. The 55-day TAT is comparable to previous years (i.e., 2018) with similar case submissions.

Due to the inability of DFS to hire and retain Forensic Evidence Specialists (FES), in 2021, the Laboratory Managers in DNA have been tasked with the FES duties as it relates to DNA evidence intake, returns, and scheduling all appointments.



The Casework Manager continues to handle the DNA Backlog Reduction Grants. In December, the DNA Backlog Reduction Grant for FY2019 ended. The closeout documentation by the laboratory was due to the Bureau of Justice Assistance (BJA) by January 30, 2022. The laboratory is currently managing 2 DNA Capacity Enhancement Backlog Reduction (CEBR) Grants. The

FY2020 CEBR grant for \$425,436 closes on September 30, 2022. The FY2021 CEBR is for \$461,430 and closes on September 30, 2023.

The amount of grant funds has fluctuated over the years. Grant funds have allowed the DNA unit to function. In 2021, about 96% of the DNA Unit’s operational costs are from grant funds.

Grant funding has increased when compared to 2017. This increase is due to the fact that the DNA Unit uses all the grant funds allotted. In 2019, DFS-DNA laboratory personnel were invited to be a part of the National Institute of Justice (NIJ) and the Scientific Working Group on DNA Analysis Methods (SWGDM) to develop a “Best Practices for DNA Laboratory Efficiency Improvements” publication.

DNA

After many delays due to COVID-19 and grants management moving from NIJ to BJA, this publication is projected to be released in 2022.

With the DNA FY2019 and 2020 grant funds, the laboratory continued to purchase reagents, consumables, and other supplies for processing casework and convicted offender samples, provide required continuing education training for each DNA Analyst, pay for external laboratory audits, purchase proficiency tests for each analyst, and purchase new laboratory equipment.

Examples of equipment and other purchases with grant funds:

- Software to allow the 7500 instruments to be upgraded to Windows 10
- Crime-lite with full UV-Vis and IR illumination for examination of evidence items
- Biological safety hood for the laboratory-replaces older one
- Printer for labeling microcentrifuge tubes
- Renovation of DNA office space
- The offender sample processing lab (CODIS Lab) will be renovated
- DNA proficiency tests required for analysts to stay current on their accreditation standards.
- The external audit for DNA Quality Assurance Standards-needed to maintain accreditation

Validation or performance checks are a critical part of forensic DNA work. Validations are done on new testing procedures, while performance checks are done to determine if there are any effects from upgrades or modifications to previously validated procedures. As noted in previous DFS annual reports, the DNA Laboratory does not have an individual primarily dedicated to performing validation/performance checks studies. Validation/performance checks are done by Analysts and/or Managers in the DNA Unit.

In 2021, performance checks were done on the 7500 (used to determine the amount of DNA in a sample) instrument due to software upgrade of Microsoft Windows 7 to Microsoft Windows 10. Laptops replaced the office desktops, so performance checks were needed on each analysts' computer for the analysis software (GeneMapper ID-X) and the statistical calculations software (PopStats). Additional performance checks were done on the following due to upgrades in specific software used: CODIS server and CODIS workstation (used to enter profiles into national or state level). All performance checks listed in this report were successful and are currently being used by the laboratory.

A validation that still needs to be completed is for Armed Xpert software. Several studies have already been completed. However, with the upgrade to Windows 10 and other analysis software such as GeneMapper ID-X, the Armed Xpert validation needed to be restarted to ensure that the data is still

accurate. Because of the upgrade in the software, we required new licenses from the vendor for Armed Xpert. The change from a desktop to a laptop, in 2021, has also delayed this validation.

As with all validations, studies must be completed, policies must be in place, and laboratory staff must be trained before using these procedures in casework or databasing. Validation studies and training are also required to maintain laboratory accreditation. During annual audits, validation study documentation is reviewed to determine if a sufficient number of studies have been performed to support the use of the new method/technology in casework/databasing. Training documentation is also reviewed during annual audits.

We continue to use a chemistry kit that examines 27 DNA markers, 7 more than the FBI requirement.

The DNA laboratory underwent on-site external audits for *2020 QAS DNA Testing Laboratories* and *2020 QAS DNA Databasing Laboratories* based on the FBI's Quality Assurance Standards in July 2021. These Quality Assurance Standards were effective as of July 1, 2020. The DNA laboratory had zero non-conformities, meaning we met or exceeded each standard. We are currently waiting on the FBI to review the results of the audit.

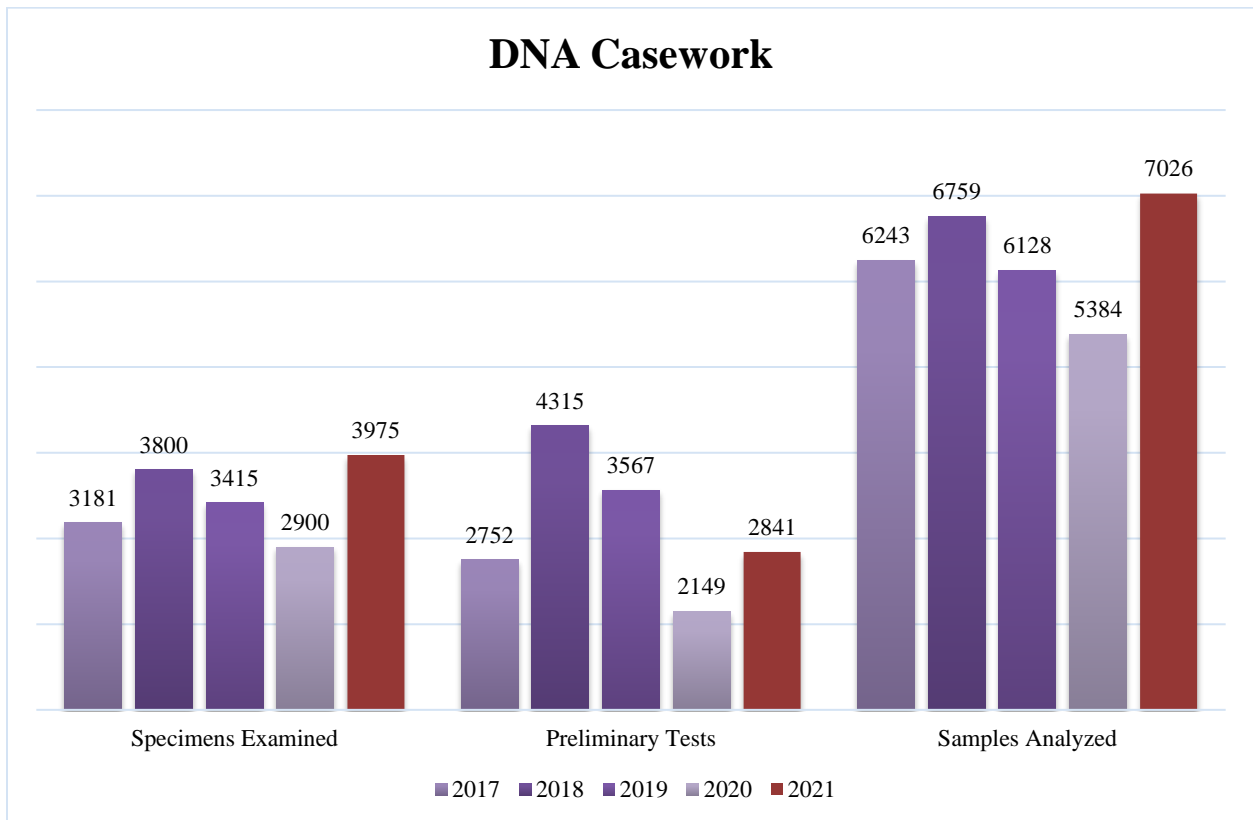
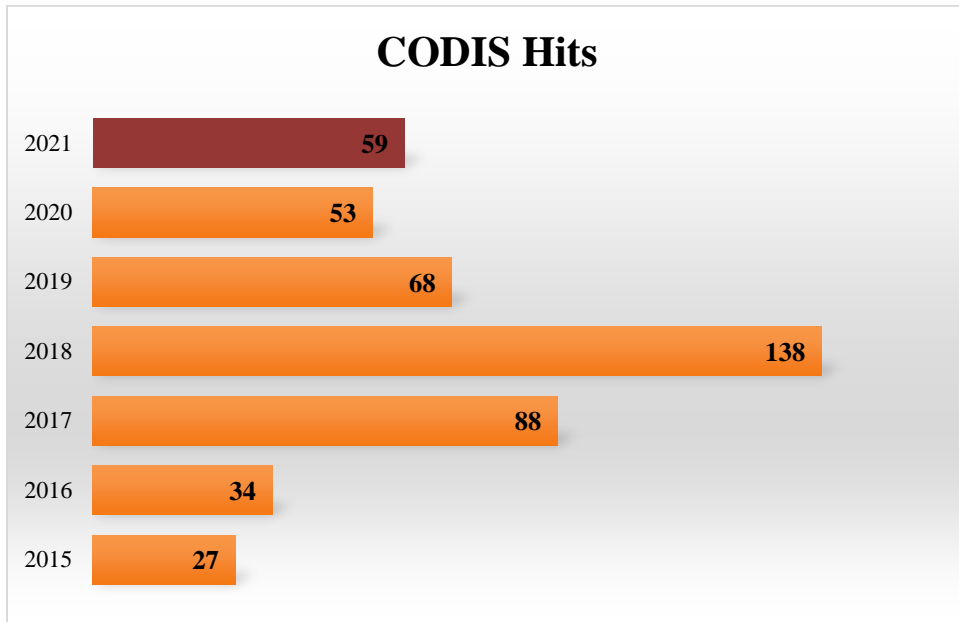
All DNA quality control documents have been uploaded to Qualtrax, allowing auditors to easily access all documents.

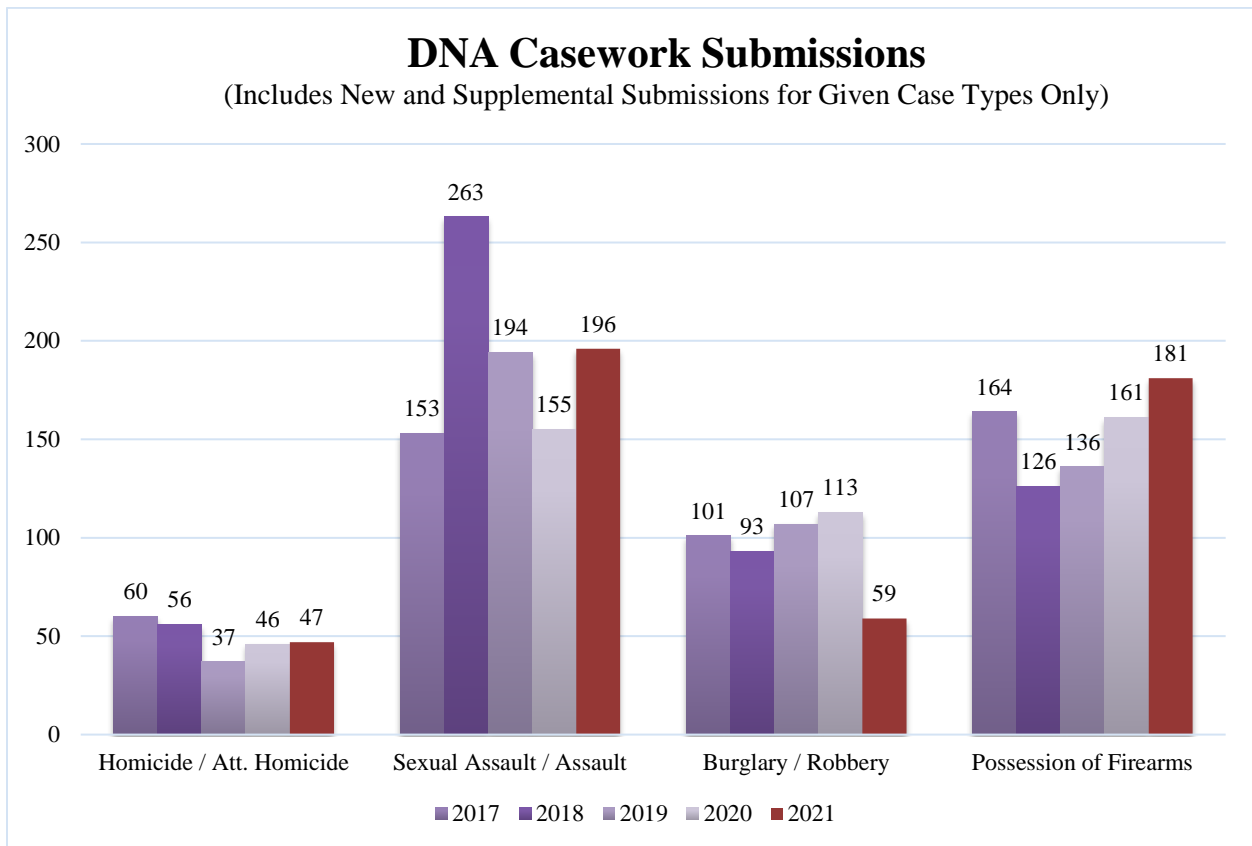
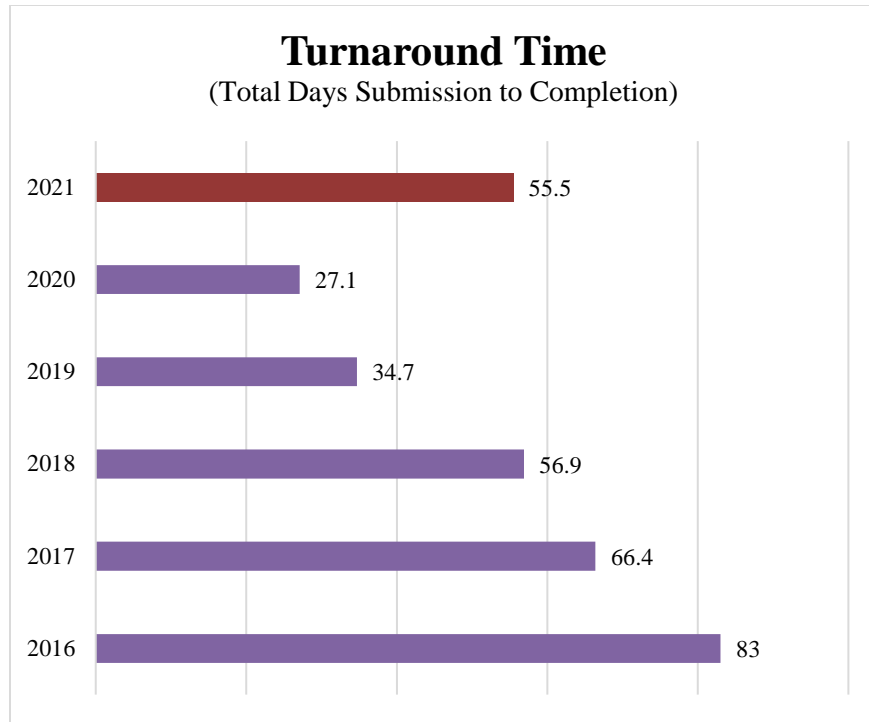
The following chart provides a comparative analysis of casework for 2017, 2018, 2019, 2020, and 2021 (the percentages in parenthesis show year-over-year changes):

	2017	2018	2019	2020	2021
Total Case completions	526 (+11%)	646 (+23%)	621 (-4%)	548 (-12%)	627 (+14%)
Turnaround Time (Total days submission to completion)	66.4 (-20%)	56.9 (-14%)	34.7 (-39%)	27.1(-22%)	55.5 (+104%)
Case submissions	549 (+23%)	622 (+13%)	592 (-5%)	561(-5%)	612 (+9%)
Staffing (full-time casework)	5 (-5%)	6 (+20%)	5.6 (-3%)	4.8 (-14%)	5 (+4%)

In summary, during 2021, the DNA laboratory received 9% more cases and examined 37% more evidence than in 2020. The number of cases completed by the DNA laboratory in 2021 outnumbered the total case submission. The DNA laboratory had a zero backlog of cases during the last quarter of 2021. We hope to keep our backlog to a manageable number in the next year.

Data





Forensic Chemistry

Overview

The Forensic Chemistry Unit (FCU) is comprised of two distinct sections. The Controlled Substances Section analyzes evidence submitted by Delaware law enforcement agencies for the presence of controlled substances. These controlled substances may be present in substances such as powders, liquids, food products, oil, waxes, plant material, paper, mushrooms, commercially produced pharmaceuticals and clandestine tablets or capsules. This section follows the Scientific Working Group for the Analysis of Seized Drugs (SWGDRUG) recommendations regarding analytical schemes for the identification of controlled substances, as well as an internationally accepted statistical sampling plan that allows the chemist to make an inference about populations by testing a set portion of exhibits with a 95% level of confidence; this sampling plan reduces the amount of time processing cases while providing scientifically valid results. The Fire Debris Section works directly with the Delaware State Fire Marshal's Office and other local offices to analyze evidence associated with arson investigations. Fire Debris case types include all fire-related deaths (including homicides), incendiary fires, and arson-related offenses. Evidentiary samples are prepared and analyzed according to ASTM International Standard Practice and Test Methods to determine the classification of any ignitable liquids present in the submitted evidence.

Staffing

The full complement of the Forensic Chemistry Unit starting in 2021 included a Laboratory Manager II, Laboratory Manager I, 10 full-time analytical chemists, 1 part time analytical chemist, 1 laboratory technician, and two Forensic Evidence Specialists. One chemist and both laboratory managers are cross trained in controlled substance and fire debris analysis. However, due to greater staffing needs in the DFS, the laboratory technician position was transitioned to a Records Management Analyst position.

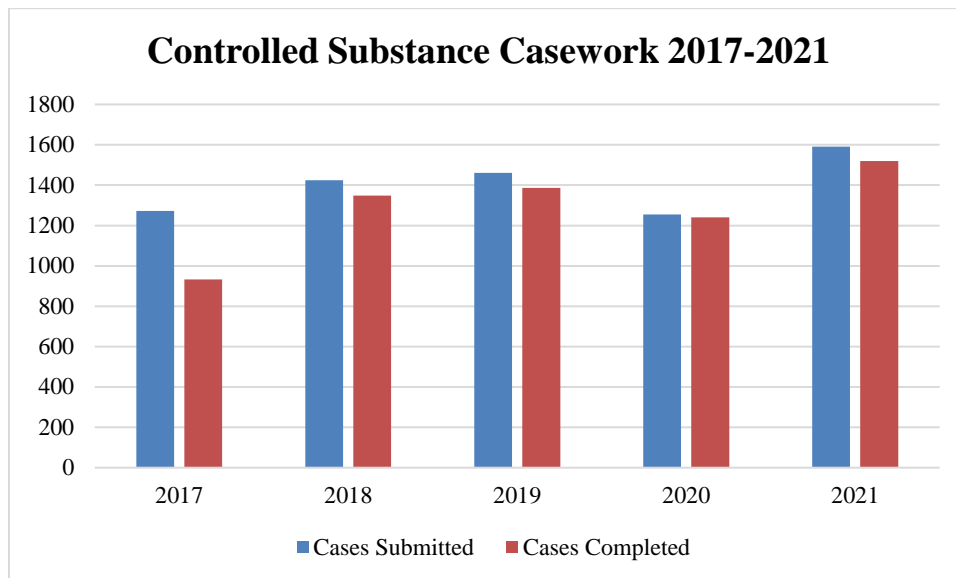
The FCU underwent significant staffing changes in 2021. Two chemists and a Forensic Evidence Specialist resigned, leaving both Forensic Evidence Specialist positions vacant for the entirety of 2021. The FCU was able to promote a fully trained chemist from casual/seasonal to full time and hire a new full time analytical chemist who is currently in training for controlled substance analysis. One laboratory manager completed the FCU fire debris training program in early 2021, and two additional controlled substance chemists began cross-training in fire debris analysis.

Despite the changes in staffing, and the addition of the Fire Debris Section, the members of the FCU were able to continue to process cases from all law enforcement agencies without a significant increase in turnaround time.

Casework and Accomplishments

Controlled Substances

The number of cases submitted increased by approximately 23% compared to the previous year. Chemists in the FCU completed 1520 cases in 2021, which was approximately 177 cases per chemist. In the cases analyzed in 2021, there were 127,427 exhibits submitted, and of those, 21,987 were tested.

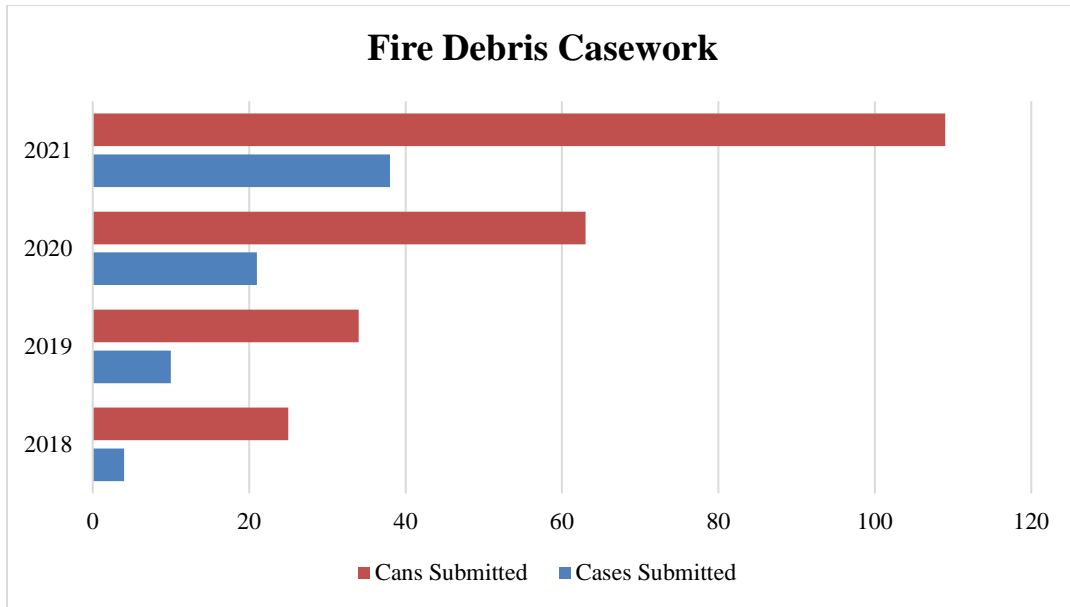


The turn-around-time for the cases was 34 days from submission to completion, however a bench turn-around-time starting from assignment to completion was 13 days across the unit.

In addition to timely and efficient case processing, the FCU remained committed to community outreach, and participated in career fair presentations for Delaware State University, a presentation to law student interns, and a chemist alumni college.

Fire Debris

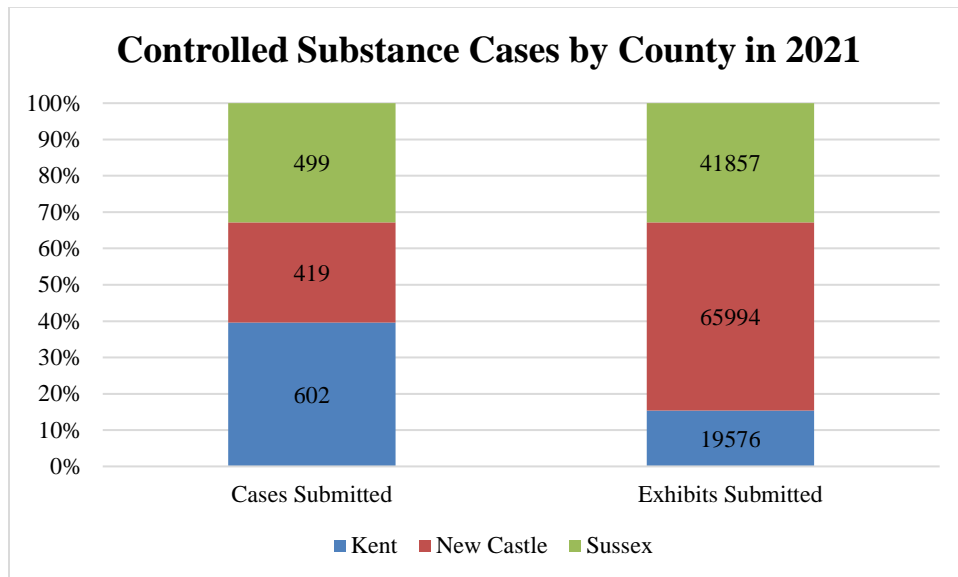
Since being accredited in 2019, the number of fire debris cases has tripled. In the 39 cases submitted in 2021, there were 109 items to be analyzed. Due to the complexity of the fire debris evidence, analysis of this evidence takes a considerable amount of time as compared to controlled substance evidence. The average fire debris case takes 26 days to analyze the data.



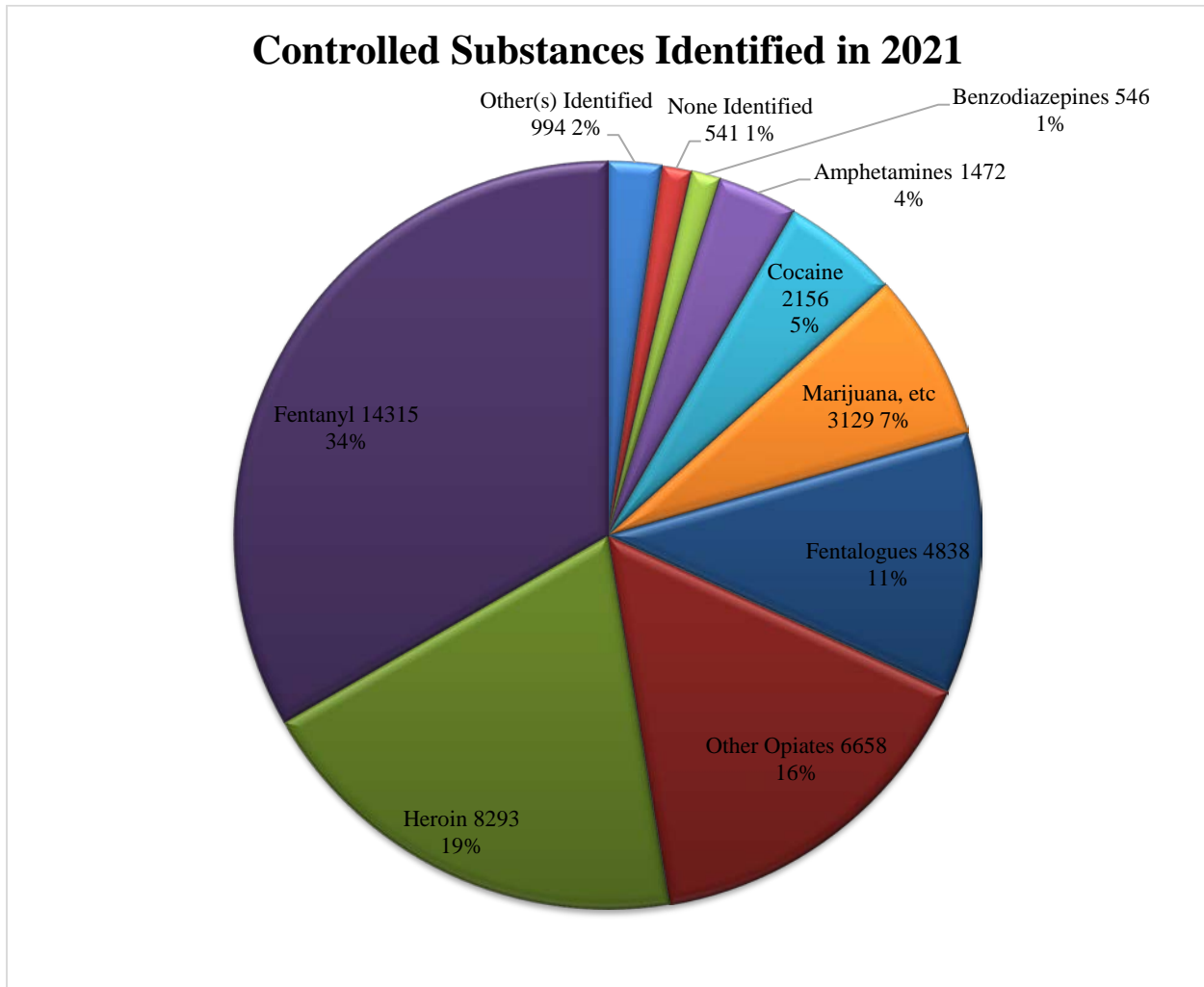
Data

Controlled Substances

The chart below illustrates the breakdown, by county, of the cases submitted to the DFS Controlled Substances Section. Although Kent County submitted the most cases, the cases only accounted for 15% of the exhibits submitted, whereas New Castle County, who submitted the least number of cases in 2021, accounted for over 53% of the exhibits submitted.



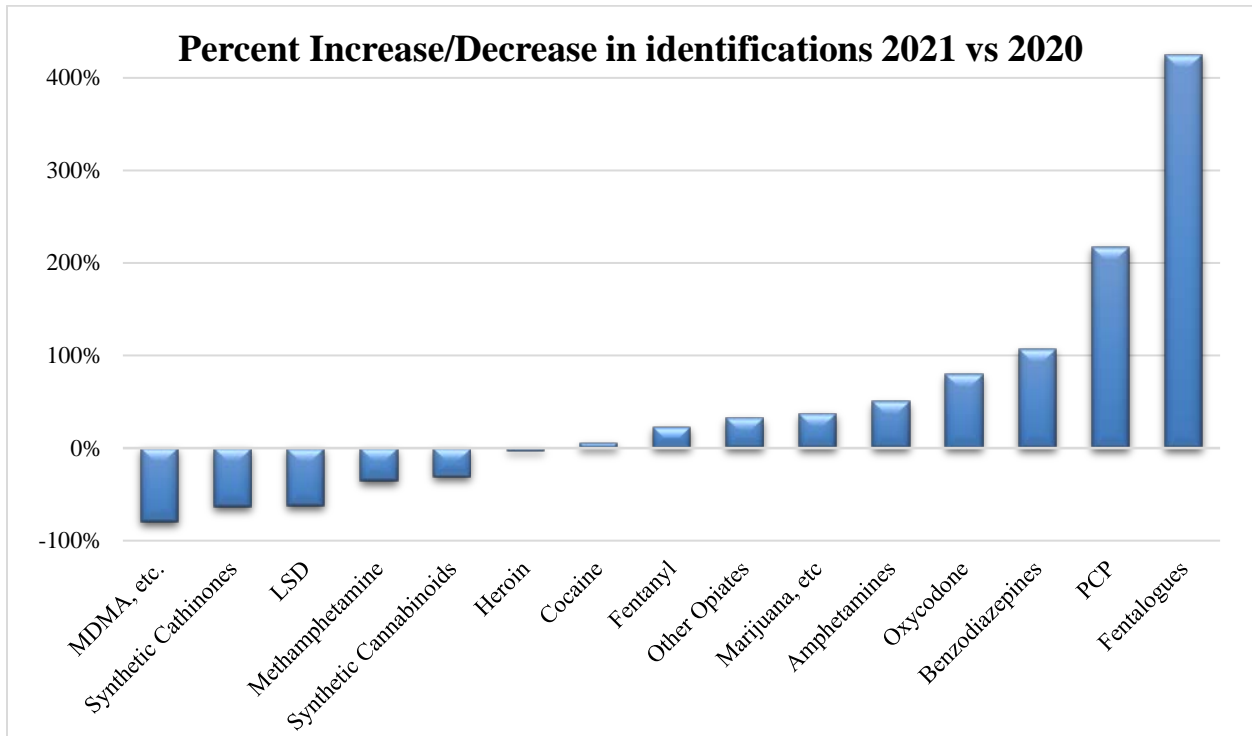
The following chart displays the substances identified by drug category. Percentages were calculated by the total number of exhibits analyzed and because the unit reports all controlled substances present, each exhibit may contain more than one.



From the identifications made in 2021, numerous categories of substances had increases or decreases as compared to 2020. MDMA, Synthetic Cathinones and LSD had the largest decreases going from 119 to 24, 708 to 261, and 8 to 3 identifications in 2020 to 2021, respectively. Methamphetamine and Synthetic Cannabinoid identifications also decreased by over 30% each. While Heroin identifications only decreased by 3% from 2020 to 2021, utilizing 2019 data shows that Heroin identifications have decreased by 25% since 2019.

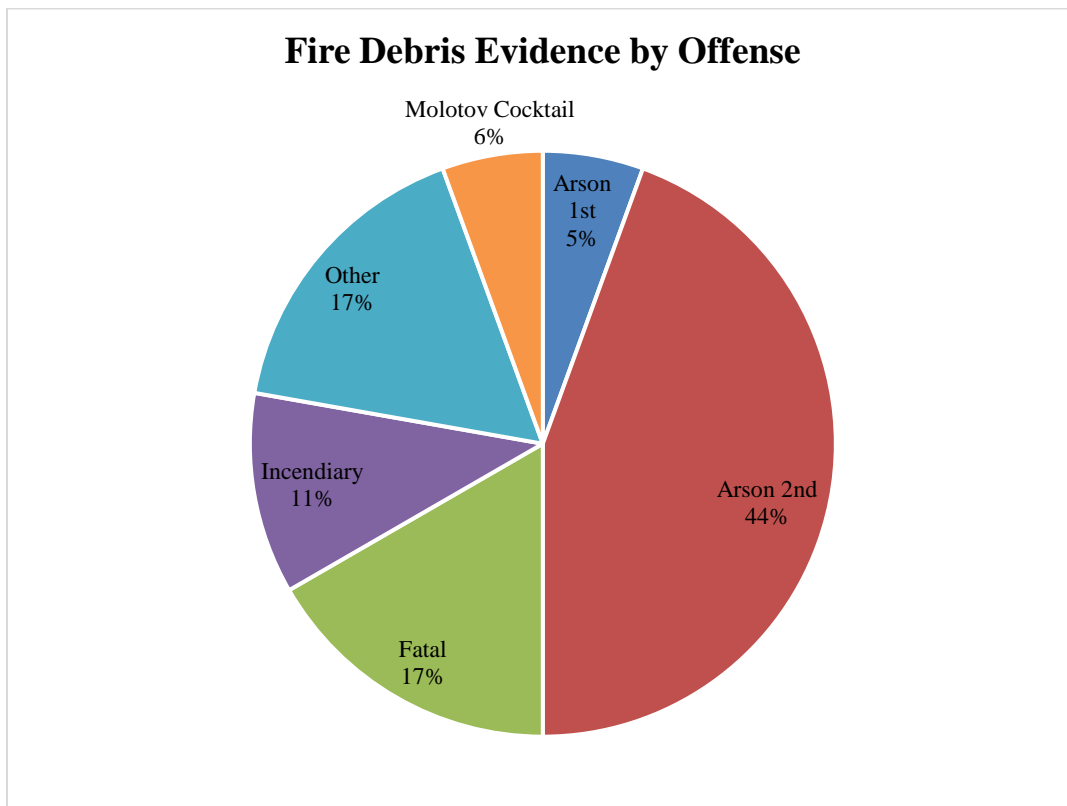
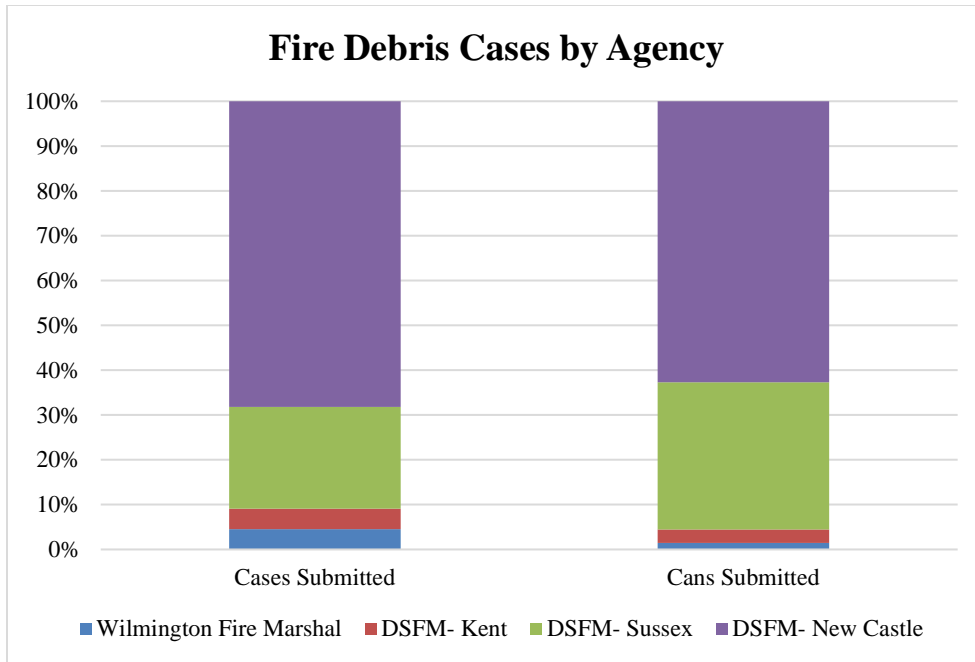
Fentanyl has been the most common substance identified in casework since 2019 and further increased by an additional 23% over the past year. More significantly however, was the 426% increase in identification of fentanyl- related compounds (fentalogues); 920 identified in 2020, 4838 in 2021. Cases consisting of

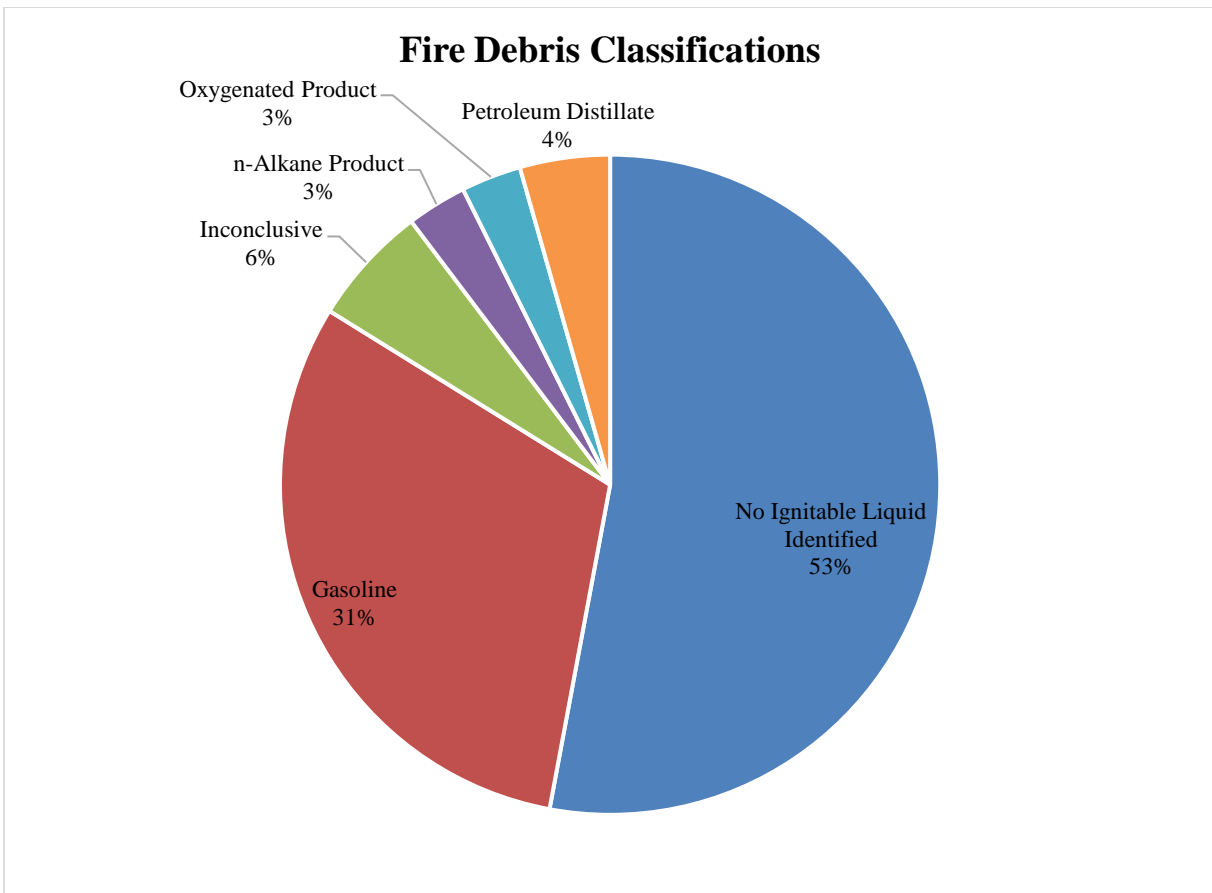
Benzodiazepines increased by over 100% due to the presence of Alprazolam, Clonazepam, Diazepam, Flualprazolam, Etizolam, Clonazolam, Flunitrazepam, and Flubromazolam identifications. PCP cases did rise considerably from 17 to 54, however the low volume did not add significantly to the overall caseload.



Fire Debris

All fire debris evidence is submitted through the OFSM Headquarters in Kent County, regardless of the location where the incident occurred. The charts below illustrate the breakdown, by agency, of the cases submitted to the DFS Fire Debris Section, the type of offense associated with the evidence, and the ignitable liquid classifications identified.





Projects and Grants

The FCU Controlled Substance Section completed a validation of the FTIR, a robust and simple analytical technique to identify compounds with a high degree of specificity. An audit of the FTIR validation, policies/procedures and training records of 3 analysts and 1 laboratory manager was conducted by the ANSI National Accreditation Board (ANAB) and addition of the FTIR to the DFS scope of accreditation for controlled substance analysis was approved.

The unit received grant funding to purchase equipment and standards toward the quantification of THC potency in plant material by microextraction and High-Performance Liquid Chromatography-Photo Diode Array (HPLC-PDA). This extraction and instrument will allow chemists to determine the amount of Delta-9-THC present in potential marijuana samples. This testing is in anticipation of Delaware's Title 16 update to reflect the federal government's Hemp Farming Act of 2018, which removes low-THC cannabis from regulation under the Controlled Substances Act.

Conclusion

For answers to further questions, please see the DFS Website at <https://forensics.delaware.gov/>. Note that emails have also changed from “@state.de.us” to “@delaware.gov.”